Ohmsett--The National Oil Spill Response Test Facility

The Ohmsett Gazette

Leonardo, New Jersey | Test with oil. Train with oil. | Spring/Summer 2006

Ohmsett Installs State-Of-The-Art Bridge Drive System

One of the main features of the Ohmsett test tank is the traveling bridge system which is operated by a system of cables, pulleys, and d.c.motor-operated winches that control the bridge speed and direction of travel. It is a key system necessary in performing testing and training functions. The Minerals Management Service (MMS) has taken on the monumental task of replacing the original aging system, which was installed in the early 1970s, with new state-of-the-art control equipment.

"The operator's console located on the third floor of the control tower serves as the main interface for controlling the movement of the bridge on the test tank," said Dave DeVitis, Ohmsett test engineer. "It is extremely important to have a control system that can accommodate our increasingly more complex testing and training requirements."

The new control system design incorporates the latest proven control technology using off-the-shelf components. In addition, upgrades and replacement of the aging integrated safety circuits were made along

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What's Inside

Empirical Oil Weathering Experiment

During the empirical oil weathering experiment, large blocks of ice were brought to Ohmsett so researchers could measure oil evaporation, spreading and dispersion in and on ice.

In the 1970s and 1980s, the Minerals Management Service (MMS) Alaska Regional Office conducted field work to test the physics for oil weathering in ice to develop oil spill response models. MMS conducted further lab research with low viscosity and low pour-point oils in the late 1980s and 1990s. It is a recognized fact by the researchers that oil weathering is strongly dependent on the specific chemical composition and characteristics of individual crude oils.

In February 2006 MMS Alaska Regional Office contracted MAR Inc., S.L. Ross Environmental Research, Ltd. and D.F. Dickins Associates to conduct an empirical weathering experiment at the Ohmsett facility. Using sophisticated measurement techniques currently available to the project team, they were able to take precise measurements of oil evaporation, spreading, and dispersion in and on ice as a function of oil type and chemistry.

Ohmsett was chosen because of its ability to support near-scale broken ice situations with realistic mixing energies that simulate real-world spill conditions in a controlled environment.

During the unusually warm winter, a large water chiller and artificial sea ice blocks, formed at U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, NH, were brought to Ohmsett for the experiments. The water salinity of the tank was also raised by adding salt to simulate that of open ocean water.

In each test, 50-gallon slicks of two crude oils were used. Measurements were taken of emulsification, evaporation, dispersion, spreading, under-ice movement, and slick thickness. Wave characteristic and weather readings were also recorded to determine the effect of pour point and viscosity on the equilibrium thickness of crude oil on cold water.

This data in conjunction with other oil-in-ice weathering information will be used to validate and enhance existing oil weathering models and to develop new algorithms of oil weathering in ice.

Ohmsett Staff Assist in Oil Herding Surfactant Research

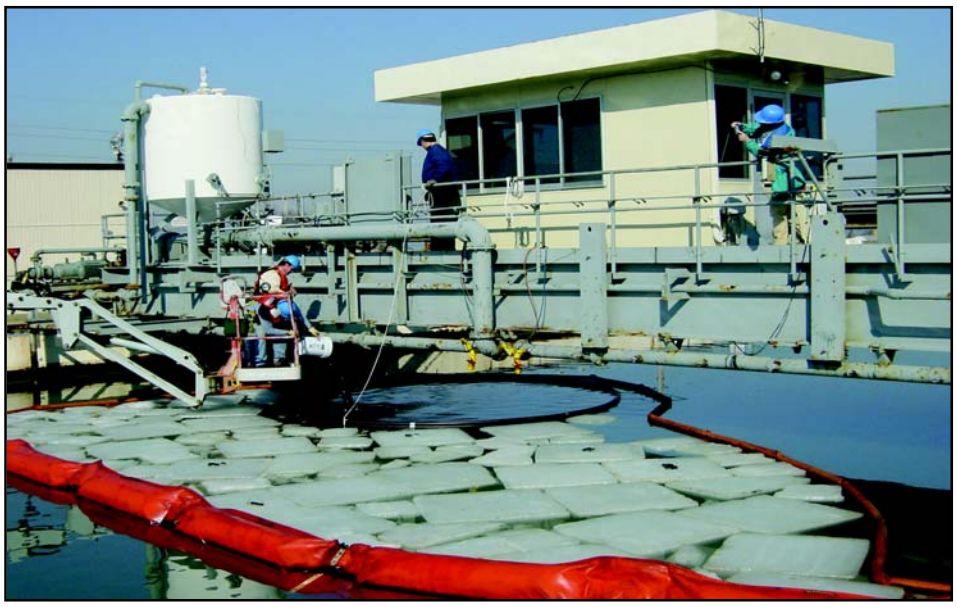
Ohmsett engineers and technicians spent several weeks in November 2005 at the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, NH assisting S.L. Ross Environmental Research, Ltd. of Canada with mid-scale research on the use of oil herding surfactants to thicken oil slicks in broken ice. The objective was to determine the effectiveness of the herding agent to contract oil slicks in pack ice to thicknesses conducive to efficient in-situ burning.

The Minerals Management Service (MMS) and ExxonMobil contracted S.L. Ross to conducted the CRREL test as part of their continued research on the use of chemical herding agents to thicken oil spills in broken ice to allow them to be effectively ignited and burned at sea. Based on previous research and testing, and the limitations of mechanical oil spill clean up equipment in broken ice conditions, in-situ burning has become a viable alternative. However, when the oil slick is too thin because of a blowout or sub-sea pipeline leak, it is difficult to ignite and burn. Chemical herding agents are now being considered as a viable option to increase the oil thickness.

Ohmsett engineers participated in drafting the test protocol during the ice tank test planning phase. Ohmsett procured the Hydrocal test oil and technicians traveled to CRREL to assist with boom deployment, sealing the tank wall, the actual tests, and clean-up.

Based on results from the CRREL ice tank tests, S.L. Ross and Ohmsett developed a subsequent test plan and protocol for Ohmsett basin ice tests. The Ohmsett test took place during the week of February 13-17, 2006.

Using ice grown at CRREL, engineers and technicians created an ice field in the Ohmsett tank to conduct an identical test at large-scale. With realistic conditions of currents and wind on the test basin, a small boom was placed in the ice field and filled with oil. The boom was then lifted to release the oil into the ice field. An oil herding surfactant was then applied around the perimeter of the ice field to thicken the oil slick.



Using ice grown at CRREL, engineers and technicians created an ice field in the Ohmsett tank to conduct Oil Herding Surfactant research at full-scale.

Bridge Drive System

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with replacing existing facility power feeds from the JCP&L sub-station to the main switch gear in the power room.

The Siemens Corporation performed the bridge system upgrades. They dismantled and removed existing control circuitry, electronics, cabinets, transformers and wiring and replaced them with new equipment. They also installed new Programmable Logic Controller (PLC), Human Machine Interface (HMI), antennas and receivers.

The Siemens control system provides speed control to 100th of a knot and precise speed and position data. The bridges may now be controlled and operated from both the control tower and the main bridge. This allows test engineers the flexibility to change test speeds instantaneously.

The new PLC can record bridge speed input data, which can be replayed, giving engineers and researchers the ability to precisely replicate a previous test.

"Siemens provides an excellent maintenance service demonstrated recently when the system required troubleshooting," explained DeVitis. "The Siemens programmer diagnosed the problem using the internet and made the necessary program change within a half hour ."

The new bridge drive system includes a computerized system so the tank's bridges may now be controlled and operated from both the control tower and the main bridge.

Oil Limited Tests New Rigid Boom System

When Oil Limited of the UK prepared to market the rigid boom system, RB400, they wanted to make sure it was tested in accordance with existing boom performance protocols.

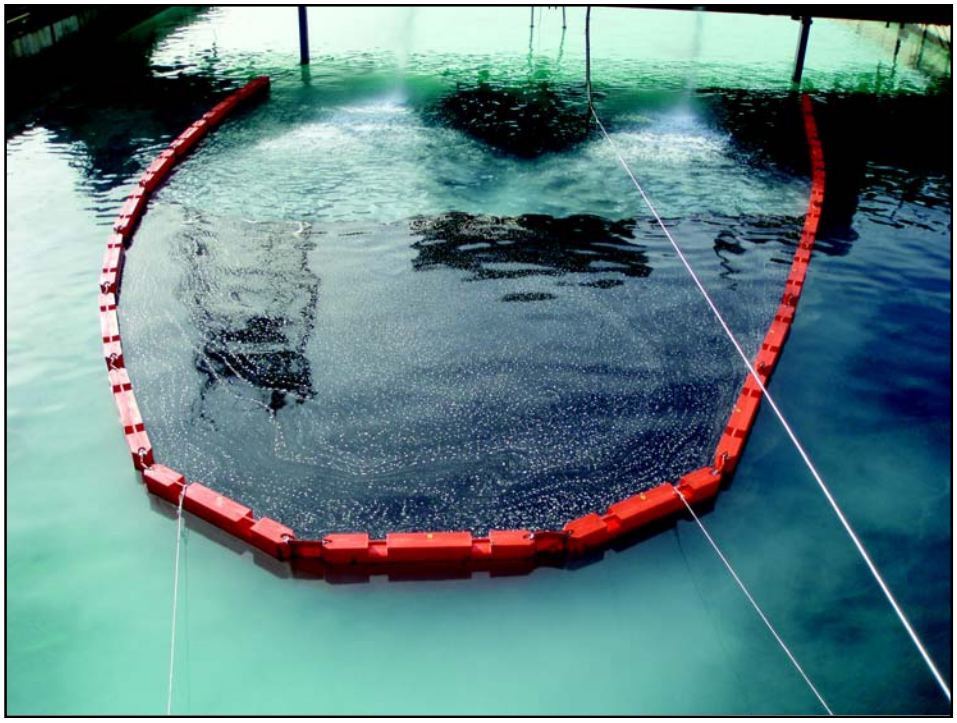
The boom system has been in development for the last 18 months. After completing sea trials in the United Kingdom, they wanted third party testing using the American Society for Testing and Materials (ASTM) protocols. In January 2006, Oil Limited came to Ohmsett for testing.

"Ohmett is the only place in the world that we felt could test our boom system and compare it to ASTM protocol," said Clive Fisk, managing director of Oil Limited.

"We came to see if there is significant gross loss speeds and boom capacity versus tow speed." Fisk said. "We found that during towing, the boom will remain at 90 degrees at water."

The RB400 is a modular polyethylene boom system that extends 400mm below the waterline and 200mm above the water. Each section is 1.4 meters long with a flexible joiner. The boom sections can be rapidly assembled to any length required since each section is buoyant and can hold a vertical position without tension wire ballast.

"Joining the boom together will contain oil at a significant depth," Fisk explained. "When oil is transferred in the contained area, it will compact the oil to the full depth of the boom."



Oil is contained in Oil Limited's rigid boom system during boom performance testing at Ohmsett in Janary 2006.

Test evaluation of the RB400 was carried out using one standard oil in calm conditions followed by similar testing in harbor chop and sinusoidal wave conditions.

Dispersant Effectiveness Testing on Realistic Emulsions Continues at Ohmsett

The use of chemical dispersants in United States waters is on the verge of achieving a similar acceptance status to that of conventional booming and skimming countermeasures. Equipment guidelines, currently being proposed by the U.S. Coast Guard, mandates that a dispersant application capability must be included in spill response plans for regions where dispersant pre-authorization is required. Therefore, it will be important to know when dispersants will likely be effective on different oil types to assist in the decision-making process for using dispersants.

The Ohmsett facility is rapidly developing into a world leader in realistic dispersant effectiveness testing through the design and development of specific test equipment, systems, and test protocol. These capabilities have been refined through testing under cold and temperate conditions using fresh and evaporated crude and fuel oils.

"Many oils when spilled in a marine environment form water-in-oil emulsions with varying stability, viscosity, and viscoelastic properties," said Alan Guarino, chemical test engineer for Ohmsett. "Therefore, there is a need for a better understanding of the chemical dispersibility of these oils to establish the window-of-opportunity for using dispersants."

To answer this question, the Minerals Management Service (MMS) funded S.L. Ross Environmental Research, Ltd. to conduct a research project to determine the viscosity limit for the effective application of chemical dispersants to realistic emulsions.

The dispersant effectiveness testing on realistic emulsions took place during ten cold days in December 2005 in the Ohmsett test tank. S.L. Ross, in conjunction with MAR Incorporated's Ohmsett engineering and technical staff, used full-scale oil emulsification equipment and protocol under development at the Ohmsett facility.

"The primary goal of the testing was to determine the role of dispersants in the clean-up of emulsified oils, and to determine if similar viscosity limits on dispersibility apply for emulsions as for viscous non-emulsified oils," said Randy Belore of S.L. Ross Environmental, Ltd.

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Skimmer Surface Materials and Patterns Tested

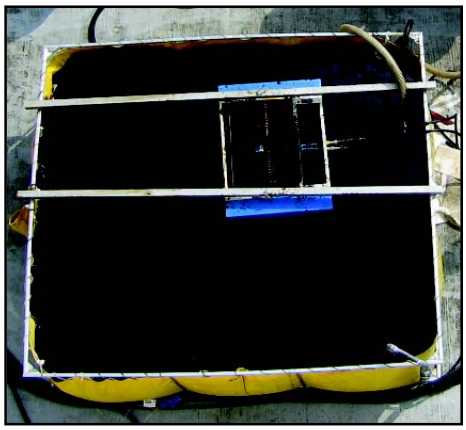
Research and testing for the optimization of oleophilic recovery surfaces was conducted by the Bren School of Environmental Science and Management, University of California Santa Barbara (UCSB) and funded by Minerals Management Service (MMS). Full-scale tests of novel oleophilic recovery surfaces were conducted at the Ohmsett facility in August and October 2005 to determine the relationship between selection of the recovery surface material and recovery efficiency.

An oleophilic skimmer is a common type of mechanical oil recovery equipment. It exploits the property of oil enabling it to adhere to the rotating skimmer surface in preference to water. The adhesion surface is the most critical element of the skimmer as it determines the efficiency of recovery.

Over the years various oleophilic recovery surface configurations, such as mops, belts, brushes, discs, and drums, have been developed to increase skimmer efficiency. However, despite these variations, the materials used to manufacture the surface of oleophilic skimmers have essentially remained the same.

This current research was to study adhesive properties of oil to various materials and surface patterns in an effort to lead development guidelines for selecting the most efficient oil spill recovery surface. It is believed that the use of skimmer surface materials and patterns with a high oil recovery potential will increase oil spill recovery rates and oil to water ratio efficiencies, resulting in more effective oil spill cleanup.

Based on laboratory and small-scale studies, five oleophilic materials were chosen as candidates for rotating drum skimmer recovery testing at Ohmsett. They included aluminum, polyethylene, polypropylene, Neoprene, and Hypalon®. Smooth rotating skimmer drums were constructed using these five recovery materials. In addition to the smooth drum surfaces, three grooved surface profiles were tested. The materials used in the construction of these grooved drums were aluminum, Neoprene, and Hypalon®.



Victoria Broje of Bren School of Environmental Science and Management, University of California Santa Barbara tests oil spill recovery rates during the oleophilic skimmer recovery surface research at Ohmsett.

The skimming system used for the test was the Elastec Mini Max® drum skimmer, chosen for its reliable, proven and simple design. For testing purposes, the unit was modified to limit oil recovery rates to approximately 10 gallons per minute.

The major variables used in the test included: oil type, oil film thickness, drum rotation speed, air temperature, material of the recovery surface (Aluminum, Polyethylene, Polypropylene, Neoprene, and Hypalon®), and the pattern of the recovery surface (smooth and grooved).

"This study has increased our understanding of the interactions between oil and the material of the recovery unit," said Victoria Broje, doctoral student at UCSB. "It allowed us to identify recovery parameters resulting in higher recovery efficiency."

During the test, it was found that the decrease of oil film thickness from 25 mm to 10 mm reduced the recovery rates up to 2-3 times, while increasing it to 50 mm did not have a major effect on the recovery efficiency. The study showed that while the selection of the recovery surface material can increase the recovery rates up to 20%, the novel surface pattern can increase the recovery efficiency up to 200%. Oil type, drum rotation speed and ambient temperature were factors that also proved to have a significant effect on oil recovery rates.

"Based on these results, we will plan future tests with new surface patterns and oleophilic materials for oil spill recovery under cold-water conditions and in ice-infested waters," said Broje. "We will also study how surface patterns can be tailored to achieve the most efficient recovery of specific petroleum products such as diesel and fuel oils, crude oils, and heavy petroleum products (IFO and Orimulsion®)."

Dispersants

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Over the past six years MMS has funded MAR Inc. and S.L. Ross to conduct 13 research experiements at Ohmsett to evaluate the effectiveness of chemical dispersants, dispersant application techniques, and emulsion breakers in oil spill response. S.L. Ross has assisted Ohmsett in developing ways of producing large batches of realistic emulsions that simulate those found at an actual oil spill after being weathered on the water several hours to days.

Candidate oils were weathered and emulsified using the Ohmsett full-scale emulsification equipment and protocol. The viscosity, water content, and water drop-size distribution of each test emulsion generated were documented. These emulsions were then tested for dispersant effectiveness using energetic wave conditions and the newly developed distribution systems and test protocol that have been used in previous dispersant testing in the Ohmsett test tank. Corexit 9527 and 9500 dispersants were used at a dispersant-to-oil ratio of 1:20. These are the most commonly used and stockpiled dispersants in the United States. Different levels of emulsification based on water content and viscosity were used in the test program.

Ohmsett Hosts Reception at the InterSpill 2006 Conference

Ohmsett staff members spent a week in March 2006 at the Interspill 2006 Conference and Spill 06 International Exhibition at the ExCeL Centre in London, England.

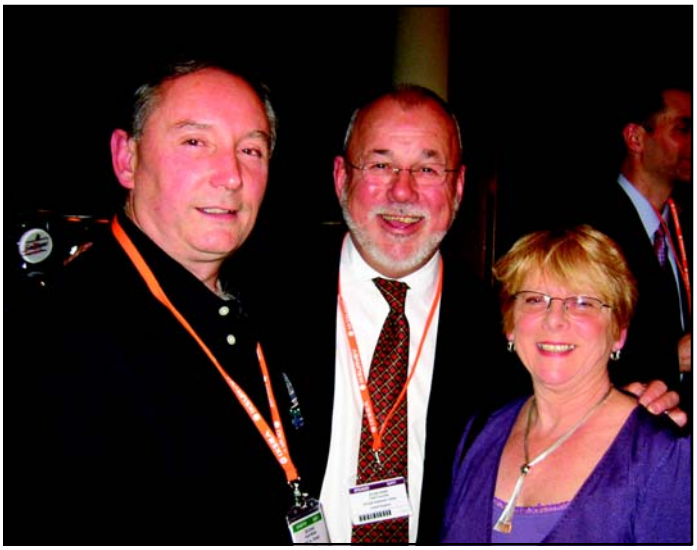
Attendees at the conference and exhibition had the opportunity to exchange experiences and knowledge, and to see first-hand the latest capabilities of leading suppliers of services and technologies.

Over 100 exhibitors from all over the world participated with displays on the exhibition floor focusing on the challenges of prevention and response to oil spills on land and at sea. Program Manager Bill Schmidt, Test Engineer Dave DeVitis, and Marketing Specialist Jane Delgado greeted visitors at the Ohmsett booth showcasing the latest full-scale dispersant effectiveness testing, training, and research conducted at its facility.

Conference sessions provided a platform for discussion of experiences on how to prevent and respond to oil spills. A very popular topic was dispersant use, research, and testing, in which most sessions were filled to capacity. Joe Mullin, oceanographer for Minerals Management Service (MMS) presented a paper on *Five years of dispersant research in the Ohmsett Wave Tank: Controversial problems; limits of response technology; methods and training.*

The highlight of the conference was the customer reception hosted by MMS, MAR Incorporated, and the Ohmsett staff on March 21 at the beautiful Tapa Tapa restaurant within the ExCeL Centre overlooking the London Docks. It was the perfect setting for the guests to take a break from conference sessions and to speak with Ohmsett representatives about current issues in oil spill response research, testing, and training.

During the reception, MAR's Chairman and CEO Mike Norcio pointed out the testing and training features of Ohmsett and the strides being taken to update and improve the test facility. Some of those features include the new bridge drive system, construction of the new oil/water lab, and upgrades to the test tank itself.



Ohmsett Program Manager Bill Schmidt visits with Archie Smith, Interspill conference chairman, and his wife Mims at the Ohmsett Customer Reception at Interspill 2006 in London, England.

Ohmsett Program Manager Bill Schmidt, MMS Oceanographer Joe Mullin and MAR's Chairman and CEO Mike Norcio at the Ohmsett booth at the Spill 2006 Exhibition held at the ExCeL Centre, London Docklands.

The ExCeL Centre, London Docklands was the site for the Interspill 2006 Conference and Spill 06 International Exhibition.

Catch Us At The Next Conference!

Clean Gulf Conference & Exhibition
October 18-19, 2006
New Orleans, Louisiana

Heavy Oil Detection with Laser Fluorometers Tests Return

Representatives from the U.S. Coast Guard Research and Development Center returned to Ohmsett in September 2005 to conduct another round of laser-based oil detection systems to determine their ability to detect and track floating or subsurface oil in a marine environment.

Previous laser fluorometer studies were performed in early 2005 under controlled tank conditions in the Ohmsett facility's high bay area. The new tests were conducted at scale in the test basin with selected systems based on their prior performance: the NASA Airborne Oceanographic LIDAR (AOL-3), a commerical system by Laser Diagnostics Instruments International, Inc. (LDI3), and a fluorescence LIDAR developed by Science & Engineering Services, Inc. (SESI).

An engineer from SESI fine-tunes their fluorescence LIDAR system prior to a test.

The objective of the new test was to determine if the systems, with some improvements, could detect floating and subsurface oil under various test conditions.

In the Ohmsett basin, tests were performed in contained surface slicks and underwater targets. The contained experiments were used for sensor testing in both stationary and transit modes, as well as in calm and wave conditions.

The subsurface tests took place with suspended targets at one- and two-meter depths.

In addition to testing during the day, night testing was conducted to test the fluorometer's ability to detect oil at night.

Community Relations

Monmouth Junior Science Symposium Visits Test Tank

Students from over 50 high schools in central and southern New Jersey attended the 2006 Monmouth Junior Science Symposium conducted at Monmouth University and Fort Monmouth, New Jersey March 30 – 31, 2006. The symposium was sponsored locally by the United States Departments of the Army and Navy, Fort Monmouth, Monmouth University, and the Academy of Applied Science.

The two-day symposium included tours of Naval Weapons Station Earle and the Ohmsett Facility. Nine students and their teachers visited Ohmsett, and were shown a video of the facility. Rich Naples, Ohmsett's Health & Safety Specialist, conducted a question and answer session, which included topics such as in-situ burning and the use of dispersants. Rich also took them on a tour of the facility, and concluded with a visit to the Building R-26 roof, where they were given a bird's eye view of the test tank.

Algerian Delegation Visits Ohmsett

Ten foreign leaders from the government of Algeria visited the Ohmsett facility November 18, 2005. The tour was sponsored by the US Trade and Development Agency (USTDA). The Algerian delegation was escorted by Decision/Analysis Partners representatives Rebecca Gil and Richard Shieldhouse.

The delegates came to Ohmsett to learn about oil spill response and recovery. During their visit they watched a video presentation of the facility. Ohmsett Program Manager Bill Schmidt answered questions from the audience and conducted a tour of Ohmsett . Among the topics discussed during the tour were capabilities, testing and training activities, devices and equipment, and an overview of the tank and bridge.

Marine Science Class Visits Ohmsett

Twenty-three high school seniors and their teacher from Manalapan Township High School toured Ohmsett on October 27, 2005. The marine science class was intrigued as they watched a ten minute video of the facility. During the question and answer session, Rich Naples, Health & Safety Specialist, responded to their questions concerning the test tank. Prior to their departure, Rich gave them a tour of the facility and its operations. ~ Joyce Rosenberg

Would You Like to Visit Us?

If you're in the area and would to visit the Ohmsett facility, please call Joyce Rosenberg at 732-866-7183 ext. 10 or e-mail jrosenberg@ohmsettnj.com to make arrangements.

The Ohmsett Gazette is available by Mail or in Electronic Format

Thank you for reading *The Ohmsett Gazette*, a biannual publication filled with informative reports on the testing, training, and research conducted at the Ohmsett Facility located in Leonardo, NJ, USA. If you would like to continue to receive *The Ohmsett Gazette*, please complete and return the form below with your mailing preference:

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Ohmsett Provides a First-Hand Look at Dispersant Testing

On February 28, 2006, more than 50 guests from all over the world packed the Ohmsett training room before they headed outside to the test tank to observe the experiments first-hand and tour the facility. There they received an introduction to Ohmsett and its capabilities, testing, and training activities, as well as an overview of the test basin and its systems to better prepare them for what to expect.

Visitors braved the cold wind on the deck of the test tank to observe two full-scale dispersant effectiveness experiments. It was an opportunity for the guests to see actual dispersant effectiveness testing and to experience dispersant test protocol which has been designed and developed at this facility

The visitor group was comprised of representatives from the U.S. Environmental Agency Protection Agency (EPA), the National Oceanic and Atmospheric Administration (NOAA), U.S. Coast Guard Headquarters, National Strike Force Coordination Center, MSO Juneau, AK, MSO Seattle, WA, and the Atlantic and Pacific Strike Team, New Jersey Department of Environmental Protection – Bureau of Emergency Response, BP, ExxonMobil, Shell, the University of California, the University of Japan, Environment Canada, the Marine Spill Research Corporation and other members of the oil spill response community.

Accompanied by Minerals Management Service (MMS) Oil Spill Research Program Manager Joe Mullin, Ohmsett Facility Manager Bill Schmidt, Ohmsett Test Engineer Dave Devitis, and Ohmsett Health and Safety Specialist Rich Naples, the visitors received a tour of the facility and a first-hand look at the experiments.

From the deck of the test tank, observers saw the crude oil being sprayed onto the waters' surface and then watched as dispersant was applied.

The Ohmsett Gazette is published by Ohmsett--The National Oil Spill Response Test Facility--to update our readers on activities at the facility.
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Test with oil *Train with oil*