Oil Spill Response Research & Renewable Energy Facility

The Ohmsett Gazette

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Herding Agents Persistence in Waves

Over the course of one week in May 2011, S.L. Ross Environmental Research, Ltd. came to Ohmsett to continue the Bureau of Safety and Environmental Enforcement (BSEE) funded research on chemical herder persistence in waves. This particular portion of the research focused on using oil herding agents for rapid response *in-situ* burning of slicks on open water.

The objective of the seven-day research was to determine how long the monolayer surfactant film will last as a function of sea state, and to what degree periodically replenishing the film can counteract the oil's tendency of spreading into a thin layer.

During the tests, small amounts of U.S. Navy (USN) herder, Silsurf A108 herder, and Silsurf A004-D herder were used. The test area consisted of a floating plastic ring placed in a boomed area of the tank. The herding agent was carefully placed on the water surface within the ring and oil was gently poured onto the surface inside the ring. As the waves started, the containment

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What's Inside

The Wendy Schmidt X CHALLENGE Million Dollar Winner

Elastec/American Marine was the first place million dollar prize winner of the Wendy Schmidt Oil Cleanup X CHALLENGE.

At the end of three grueling months of testing and with all the data collected, the X PRIZE Foundation announced the winners of the Wendy Schmidt Oil Cleanup X CHALLENGE at a ceremony on October 11, 2011 in New York City. The first place team, Elastec/American Marine, from Illinois, and the second place team, NOFI from Tromsø, Norway emerged from 10 finalists selected out of more than 350 entries from around the world in the competition.

The 10 finalists demonstrated their cleanup systems during rigorous testing at Ohmsett throughout July, August and September, where they each demonstrated their individual technology in the Ohmsett test tank.

The X CHALLENGE set bold and achievable targets raising the bar of oil spill cleanup in order to inspire breakthrough innovation. In the case of this competition, the final teams were asked to more than double the industry's previous best oil recovery rate (ORR) tested in controlled conditions by requiring them to demonstrate the ability to recover oil from the water's surface at an ORR above 2,500 gallons per minute (gpm) and an oil recovery efficiency (ORE) of greater than 70 percent oil-to-water ratio.

This competition required the largest volume of oil ever used in more than four de-

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Million Dollar Winner

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cades of testing at Ohmsett.

The $1 million First Place prize winner, Elastec/American Marine, a manufacturer of oil spill and environmental equipment with a reputation for innovation in machinery design that has grown to become one of the largest manufacturers of oil spill equipment in North America. Their oil-skimming system, with four rows of rapidly spinning grooved discs, achieved 4,670 gallons of oil per minute at 89.5 percent efficiency - a recovery rate that was three times more efficient than the industry's previous best oil recovery rate, tested under controlled conditions. The team members were: Don Johnson, Donnie Wilson, Jeff Cantrell, Stewart Ellis, Charles Storey, Brian Orr, and the Glosten Associates, Inc.

Coming in as the $300,000 Second Place prize winner, Team NOFI tested their single vessel unit called the Current Buster 6, which collects, separates and stores oil in an alleged current up to five knots. Their system incorporated a flexible v-shaped surface boom towed between two vessels or alongside one (via an overhead arm), which corrals oil down to the end of the V where a separator removes it from the water. Their system's recovery rate was 2,712 gpm at 83 percent efficiency. The team members were: Dag Nilsen, Øystein Woie, Tor Kristian Fagerheim, and Birgit Pedersen.

The 10 teams that competed at Ohmsett were: CRUCIAL, Elastec / American Marine, Koseq, Lamor, NOFI, OilShaver, OilWhale, PPR, Voraxial, and Vor-Tek.

For more details on the competition and the 10 final teams, visit the Wendy Schmidt Oil Cleanup X CHALLENGE website www.iprizecleanoceans.org.

The Wendy Schmidt Oil Cleanup X CHALLENGE First Place prize winner Elastec/ American Marine oil-skimming system with four rows of rapidly spinning grooved discs achieved 4,670 gallons of oil per minute at 89.5 percent efficiency.

Second Place prize winner, Team NOFI with their single vessel unit, the Current Buster 6. The system's recovery rate was 2,712 gpm at 83 percent efficiency.

WENDY SCHMIDT OIL CLEANUP X CHALLENGE

Ohmsett Upgraded for the Largest Skimmer Test Held at Facility

During the Wendy Schmidt Oil Cleanup X CHALLENGE, Ohmsett provided a controlled marine environment using real oil where similar test conditions could be replicated for each team participating in the competition. Preparing the Ohmsett facility was an important step in providing that environment. Many upgrades had to be made to accommodate the rigorous testing of the competition.

With the increased flow rates of recovered fluid during the tests, upgrades were made to the manifold system, which directs the flow from the skimmer discharge hoses to the recovery tanks. During the upgrades the six-inch inlet was replaced with a 10-inch inlet. From the inlet, the line split into two 10-inch lines, which transitioned into eight inches just before entering an eight-inch three-way valve mounted on two sets of four-bank recovery tanks. The three-way valves were installed to allow the manifold system to run in bypass mode while the skimmer achieved steady state prior to collecting oil. During the competition, the valves were then swung to direct flow to the recovery tanks for the timed portion of the runs. Each of the eight recovery tanks on the auxiliary bridge could hold 600 gallons each for a total capacity of 4,800 gallons of fluid.

During each test run, 27,000 gallons of oil was used to create a one-inch slick that covered the entire test tank. A temporary tank farm was constructed using 20,000 gallon FRAC Tanks and installed in a secondary containment area to hold all the test oil for the 10 week test.

In addition, Ohmsett staff constructed a decon area similar to the FRAC Tank secondary containment area where the competitors cleaned their equipment at the end of their testing.

A temporary secondary containment area was constructed where FRAC Tanks were used for test oil storage.

Additional recovery tanks were added to the auxiliary bridge to accommodate the high capacity fluid collection.

Herding Agents Persistence in Waves

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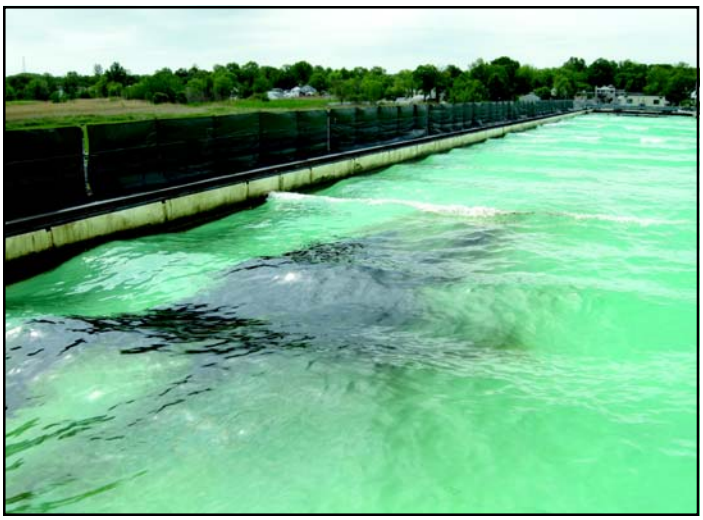
ring was lifted to allow the slick to drift as long as possible, until it reached the tank wall or the containment boom.

At the end of each test, the residual herder from the water surface inside the boomed area was dispersed by running a train of breaking waves down the tank for several minutes and using the Main Bridge fire hoses to disperse the herder into the water column.

For more information and the final report, visit http://www.bsee.gov/Research-and-Training/Master-List-of-Oil-Spill-Response-Research.aspx.



A herding agent was placed on the water surface and oil was gently poured onto the surface. The wave generator was then started, and the slick was allowed to drift until it reached the tank wall or the containment boom.

Responders Train to Clean the Oceans and Seas

For more than eight years, Alaska Clean Seas (ACS), an oil spill response cooperative, has come to Ohmsett for their annual advanced oil spill response training. In October, ACS instructors held two one-week sessions for their experienced oil spill responders from member companies that included Alaska Department of Environmental Conservation, Alyeska Pipeline Service Company, BP, ConocoPhillips, Marine Spill Response Corporation, Pioneer Natural Resources, Shell Offshore, and Western Canada Marine Response Corporation.

The training curriculum incorporated classroom topics, tank exercises, equipment deployment, and a field deployment. "The main objective was to give students hands-on experience in oil with different mechanical recovery methods and learn the limitations of equipment," said Pat Cosgrove, training specialist for ACS. "We split the class into three groups: One on the main bridge, one on the back deck area, and one in the classroom. We then rotated about every two hours so each group completed each activity every day in different wave conditions."

Classroom topics included: a review of the application of all types of skimmers and pumps, instruction on tactical response decisions, and a review of the behavior of oil on water. Representatives from the skimmer manufacturers, Shon Mosier of Elastec/ American Marine, Richard Forbes of Crucial Incorporated, and Dan Beyer of Lamor, were invited to provide an overview of the latest technical information, and describe the evolution in the development of a skimmer. Outside in the tank, each one provided a demonstration of their products. "It was fantastic having this relevant information available," said Cosgrove, "The students really got into it, asking many questions."

During the tank exercises, each student operated a skimmer from the main bridge and collected oil into an individual tanks to determine the oil/water ratio. The results from these skimmer runs were tabulated and averaged into a cumulative total. "Each morning, we used this data as a talking point to compare what the students with the best oil/ water ratios were doing differently," explained Cosgrove. "We then had a Student Appreciation Dinner on Thursday night to crown the skimming champion, and roast each other."

Another rotation during the training included the deployment of skimming equipment on the back deck area of the Ohmsett tank. This equipment included: rope mop, disc, fuzzy drum, grooved drum, manta ray, brush, and weir skimmers, along with peristaltic, diaphragm, spate, and centrifugal trash pumps.

"This year we found the missing link to our equipment activities. We conducted a team competition in the fold-a-tanks on the back deck of the tank where each team would have two hours to use our equipment in any combination to collect the highest quality of oil," said Cosgrove. As with the advancing skimming exercises, samples were taken and then analyzed the next morning during classroom discussions.

On the final day of class, the students traveled to Marine Spill Response Corporation (MSRC) in Perth Amboy, New Jersey to board the MSRC New Jersey Responder. While onboard the vessel, they participated in an open water response exercise in the New York Harbor where the students received hands-on training deploying the inflatable Ocean Ro-Boom and the Transrec Skimming System.

During the Alaska Clean Seas Training, students received hands-on training and participated in a team competition where each team had two hours to use the equipment in any combination to collect the highest quality of oil.

Ohmsett Training Facility
Train With Oil

Ohmsett provides a venue for private sector and government agencies to train their personnel using their own curriculum and equipment. Hands-on training sessions are available with or without classroom instruction.

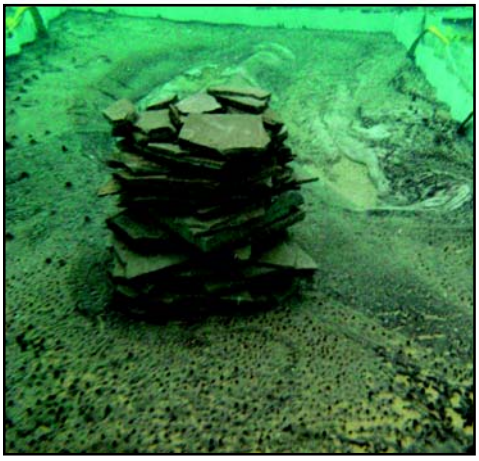
For customized classes that meet your specific training needs, please call 732-866-7286.

USCG R&D Center Investigates Cleaning Up Submerged Oil

The U.S. Coast Gaurd Research & Development Center (RDC) of Groton, Conn., has been conducting a multi-year project to develop ways to detect and clean up sunken oil in U.S. waters. The underwater environment poses major problems, including: poor visibility, difficulty in tracking oil spill movement, colder temperatures, inadequate containment methods and technologies, and problems with the equipments' interaction with water. During the first two years of the project, Kurt Hansen, project manager at the RDC, and his team came to Ohmsett in 2008 and 2009 to evaluate technologies to detect heavy oil underwater.

For the third phase of the project, RDC returned to Ohmsett in November 2011, this time to evaluate three vendor's prototype recovery systems. This phase, funded by the Bureau of Safety and Environmental Enforcement (BSEE), tested each system's overall capacities in the recovery and detection aspects of the system, as well as their deployment while working in conjunction with oil/water separation technologies.

The typical method of recovering oil on the bottom of the sea floor is for a diver to take down a suction hose so that a pump can move the oil to the surface. For shallow spills the pump is located on a vessel or pier, and it discharges into some type of holding tank. For deeper oil, submersible pumps are attached to the diver's hose and intermediate pumps may also be needed at the surface.



Ohmsett personnel constructed a simulated underwater environment by placing trays containing various sands, rock, stone, dirt, plants, seaweed, and known quantities and thicknesses of oil at the bottom of the test tank.

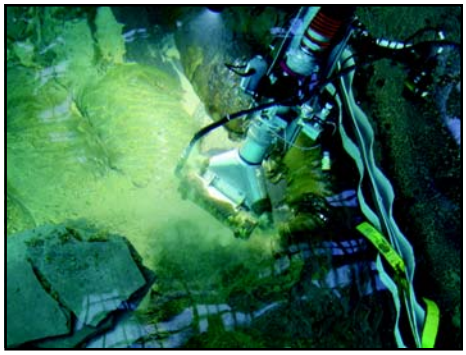
"We wanted to evaluate methods of recovering oils on the bottom, up to 200 feet; work that has been typically been done using divers," explained Hansen. "The challenge with using divers is the lack of visibility, waves, and currents, as well as the endurance and safety for the divers. That is why we chose the 200 foot mark."

The prototype systems evaluated during R&D at Ohmsett in November included Alion Science's Seagoing Adaptable Heavy Oil Recovery System (Sea Horse); Marine Pollution Control's manned submersible equipped with oil pumping recovery capabilities as well as oil detection equipment using multibeam sonar and fluorescence polarization; and Oil Stop's Sub-Dredge.

The Alion Science and Technology Sea Horse is a manned submersible equipped with oil pumping recovery capabilities, as well as, oil detection equipment.

Alion Science and Technology, of New London, Conn., developed the Sea Horse. The complete Sea Horse system consists of three major subsystems: detection, recovery, and decanting, plus auxiliary equipment. It was designed using Remotely Operated Vehicles (ROV), and uses high-resolution sonar coupled with highly accurate 3-D positioning, and commercially available generators and pumps. "In developing a system that fills the niche of a lightweight system, the three major aspects considered to be crucial were: mobility, flexibility, and low cost. This design could provide the ability to deploy multiple small systems and to respond rapidly," Hansen said.

Marine Pollution Control (MPC), of Detroit, Michigan, developed and tested a new design concept for improved submerged oil spill response capability using proven and emergent technologies. It is equipped with the RESON multibeam sonar and the EIC, a fluorescence polarization, for oil detection. The new design concept refines the pumping and reclamation systems, and replaces the requirement for a team of commercial divers through the incorporation of the SEAmagine, a manned submersible, connected to the surface by a robust, multipurpose marine umbilical system. According to Hansen, the submarine unit could allow for



The Marine Pollution Control's new design concept for improved submerged oil response, refines pumping and reclamation systems.

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Oil Stop's remote-controlled Sub-Dredge equipped with an EDDY pump, volute, and rotor, can go under, over, or around obstacles to remove sediment or oil.

Using Remote Sensing to Determine Oil Emulsion's Parameters

Ocean Imaging (OI), a California based company specializing in airborne and satellite-based imaging systems, has developed a method to remotely detect oil on the water's surface using a portable aerial imager. The project was funded by the Bureau of Safety and Environmental Enforcement (BSEE) and first tested at Ohmsett in June 2008 to determine the presence and thickness of oil on the tank's surface. In February 2010, OI returned to investigate thermal imaging signatures of several refined and unrefined oil-on-water films under near-freezing or freezing water and air temperatures.

During their work at the Deepwater Horizon oil spill in the Gulf of Mexico, OI determined that an emulsion's oil/water content ratio, weathering state, and potential thickness have varying effects on whether dispersant application or in-situ burning of a slick are viable and should be considered during a response. As a continuation of the BSEE-funded research, OI returned to Ohmsett in October 2011 to assess these parameters.

The research was to image emulsions representing different oil/water contents and weathering characteristics with the various imaging sensors. The experiments were conducted in both daytime to image the conditions during solar heating and at nighttime where there is no solar input.

Oil targets with known quantities of oil were placed in the Ohsmett tank. The remote sensing cameras mounted on the Main Bridge crow's nest were passed over the targets.

Using similar techniques as their last test at Ohmsett, the remote sensing cameras were mounted 30 feet above the water's surface on the Main Bridge crow's nest. A dozen four-foot square targets were assembled in groups of four and placed on the surface of the test tank, then tethered to the tank wall in a line beneath Main Bridge crow's nest. Intermediate fuel oil (IFO) or refined oil products and oil emulsions created by the Ohmsett staff were placed into each target to create oil slicks of various thicknesses. As the Main Bridge passed over the targets, data was collected from the sensing equipment.

In addition to imaging the emulsions themselves, the final set of experiments involved the imaging of fresh and emulsified crude oil before and after it was mixed with a dispersant. The purpose of this experiment was to determine if they could duplicate the apparent changes in surface oil thermal signatures before and after the applications of aerial dispersants similar to what was observed in the Gulf during the Deepwater Horizon spill. The initial results support the need for further testing with different oil types under more varied weather conditions, and under different sea states.

The data collected at Ohmsett will be used to develop a multispectral algorithm that will allow the aerial mapping of oil emulsion properties during actual oil spills.

A set of experiments involved the imaging of fresh and emulsified crude oil before and after it was mixed with a dispersant.

Submerged Oil Cleanup R&D

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increased operational bottom time and will minimize health and safety hazards associated with submerged oil detection and recovery operations.

American Pollution Control (AMPOL) Oil Stop Division, of Harvey, LA brought the Sub-Dredge for testing during the research. The Sub-Dredge is a remote-controlled submersible crawler pumping vehicle that also replaces the divers. It relies on an external detection system for initial detection, but uses underwater cameras for recovery. It is un-manned and controlled safely from the surface and is self-propelled on the sea floor by electrically-driven tracks. Its patented EDDY pump incorporates a hydro dynamically built volute, along with a precision-engineered geometric rotor. It is capable of going under, over, or around obstacles to efficiently remove sediment or oil. "The most distinguishing feature of the Sub-Dredge is its ability to adjust the depth of contaminant removal, hopefully minimizing the volume of clean materials removed with the contaminants, with the least amount of turbidity and re-dispersal of contaminants," said Hansen.

With this research data, the RDC will develop a decision tool for use by the on-scene commander that will determine when and where these technologies might be appropriately used during spill operations. For more information and the final report, visit http://www.bsee.gov/Research-and-Training/Master-List-of-Oil-Spill-Response-Research.aspx.

News Briefs

Clean Gulf 2011: Looking Ahead to a Brighter Future

On November 30 and December 1, 2011, Ohmsett staff attended the 21st Annual Clean Gulf Conference at the Henry B. Gonzalez Convention Center in San Antonio, Texas. Once again, this year focused on the lessons learned during Deepwater Horizon and the challenges that face the industry sectors and governmental agencies that work together to protect our environment.

During the keynote address, U.S. Coast Guard Rear Admiral Paul Zukunft, assistant commandant for Marine, Safety, Security & Stewardship spoke about the size and complexity of the Deepwater Horizon incident and the impact it will have on the region for many years to come.

In addition to the 20 sessions covering topics such as Emerging Technologies, Debris Removal Operations and Management of Spill Incidents, there were six extended workshops that offered perspectives on Dispersants, NIMS ICS, Oiled Wildlife Response, Logistical Challenges in Wildlife Operations from Capture and Release, Habitat Equivalency Analysis, and Oil Spill "Risk Based" Management.

During the conference session Response Equipment and Technologies, Ohmsett Mechanical Engineer, Paul Meyer presented a technical paper entitled, "High Capacity Advancing Oil Recovery System Performance Testing at Ohmsett during the Wendy Schmidt Oil Cleanup X Challenge Competition." He talked about the test setup and methodology used during the largest oil recovery test ever conducted at Ohmsett and what it took to get the facility ready for the competition.

Ohmsett had a booth in the exhibit hall, where between sessions visitors took the opportunity to visit the 200 exhibitors to hear about the latest developments in products and services for the response community.

Ohmsett staff met with visitors and customers during the Clean Gulf conference. Pictured above from left to right: Hung Nguyen, Emergency Oil Spill Response Coordinator, Bureau of Safety and Environmental Enforcement; Paul Meyer, Mechanical Engineer, Ohmsett; CAPT John Caplis, Chief , Office of Incident Management and Preparedness, U.S. Coast Guard; Bill Schmidt, Program Manager, Ohmsett.

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RETECH Expo Features Renewable Energy

Leading experts from the U.S. and around the world gathered in Washington, DC September 20-26, 2011 to meet with government, utility, technology and finance professionals who are driving the growth in all areas of the renewable industry. Conference delegates attended sessions covering the latest technological advances, investment opportunities, and regulatory issues for renewable energy.

Ohmsett staff attended the conference and manned a booth on the exhibit floor to meet with potential new customers and discuss the facility and its ocean energy testing capabilities. "This was a great venue to meet with representatives in the industry, especially those working on wave energy initiatives, and discuss performance testing opportunities at the Ohmsett facility," commented Bill Schmidt, Ohmsett program manager.

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