Oil Spill Response Research, Testing, and Training at Ohmsett

Paul D. Panetta, Ph.D.

OSPR/Chevron Oil Spill Response Technology Workshop

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Outline

Ohmsett Overview

Tank Specifications

Research Testing and Training at Ohmsett

Multi-agency weathering and remote sensing experiment

Summary

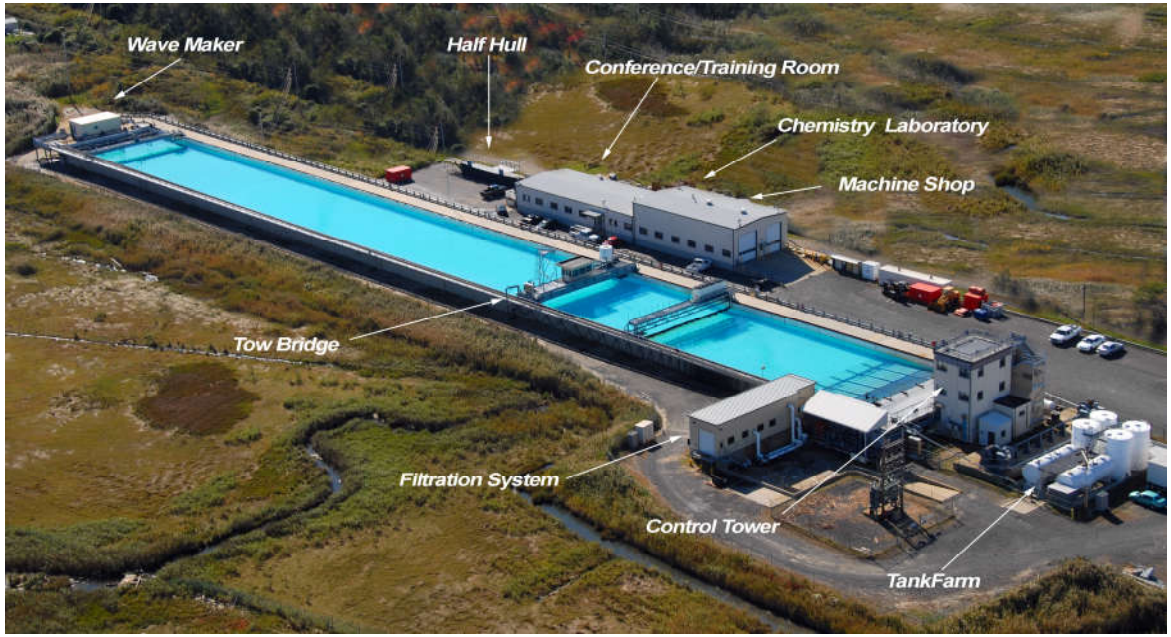
Ohmsett's Missions

To improve oil spill response technologies and remediation techniques through testing, training, and research & development.

Provide independent and objective performance testing of full-scale response equipment and marine renewable energy systems.

Provide a world class venue for training and testing that simulates spill environments in a safe and controlled manner.

Ohmsett test facility



Operated by U.S. Department of Interior's Bureau of Safety and Environmental Enforcement (BSEE) and maintained through a contract with Applied Research Associates, Inc. since September 2018

Largest outdoor salt water test tank in North America

- 203 meters (667 feet) long
- 20 meters (65 feet) wide
- 2.4 meters (8 feet) deep
- 10 million liters (2.6M gallons)
- Wave capacity: ~1 meter (~3 feet)
- Open ocean salinity (32 -35 ppt)

Located in Leonardo, New Jersey

- One hour south of New York City
- Nearby airports:
  - Newark
  - LaGuardia
  - JFK

Ohmsett test facility (cont.)

Moveable bridges capable of speeds up to 6 knots (3.1 m/sec)

State of the art data collection system

- Above surface and subsurface high definition video documentation

Computer controlled wave generator:

- Programmable amplitude, frequency, & wave length
- Wave spectrum capable
- Harbor chop: Height: $H_{1/3}$ = 83 cm
- Sine waves (practical maximums as measured):
  - Height: $H_{1/3}$ = 59 cm (wavelength =7.1m, period = 2.16 sec)
  - Wavelength: 25.3 m (at $H_{1/3}$=29 cm, Period = 5.48 sec)
- Wave damping beach system
- Ability to create breaking waves to study dispersant efficiency

Ohmsett oil products

Refined oils

- Hydrocal 300
- Calsol 8240
- Sundex 790
- Diesel Fuel

Crudes, fuel oils, other oils that have been used at Ohmsett

- Arctic North Slope (ANS)
- Dorado
- Rock
- HOOPS
- Bakken Crude
- Diluted Bitumen
- IFO
- and many others

Technical specialties

Mechanical Recovery

- Containment booms
- Oil spill skimmer systems
- Sorbents

Chemical Treatments

- Dispersant testing
- Herder testing

Oil Behavior and Fate and Transport

- Behavior of dispersed and weathered oils
- Natural emulsions

Remote Sensing

- Drones (tethered…now)
- ROVs
- AUVs
- Rotary and fixed wing aircraft
- Satellite

Arctic Environments

- Cold water and broken ice conditions

Oil Handling

- Surface and subsurface releases
- Sunken oil and neutrally buoyant plumes
- Temporary storage devices
- Viscous oil pumping
- Oil/water separators

Instrumentation and special capabilities

Particulate size distribution

- Laser In-Situ Scattering and Transmissometry
- LISST 100X qty: 2
- Silcam

Water velocity

- Acoustic Doppler Velocimetry (ADV)

Surface area of oil and ice

- Tactical Rapid Airborne Classification System (TRACS)

Slick thickness

- Visual
- Acoustic

Underwater HD video

Cranes (2)

Wave height

Water height measurement

Temperature

Wind speed

On-site oil/water chemistry laboratory

Ice making capabilities

Fabrication shop

Certified divers

Standards Development

Active member of the ASTM F20 Hazardous Substances and Oil Spill Response committee to develop and improve standardized equipment testing protocols

Ohmsett has initiated, developed, and updated numerous ASTM testing standards

Why test to the ASTM Standards?

End users need standardized tests for objective performance data. Data collected to ASTM standards provides producers and other stakeholders the ability to verify and accurately report performance of equipment and amount of oil removal.

ASTM standards developed using testing and data from Ohmsett

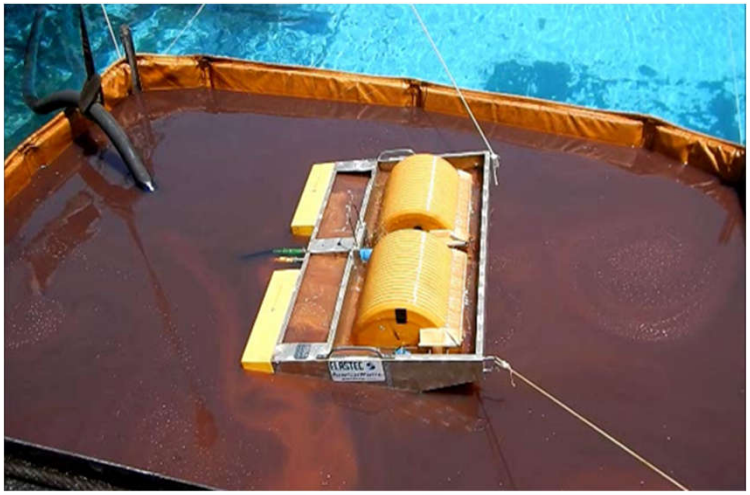
Skimmer Nameplate Capacity (F2709)

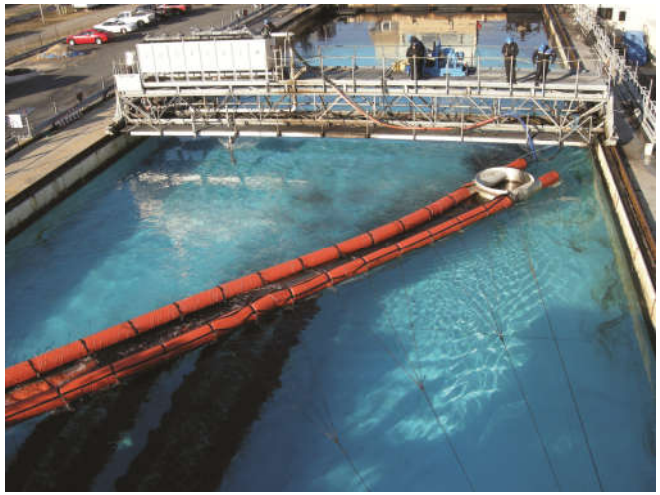
Skimmer Performance (F631)

Advancing Booms Systems (F-2084)

In-situ burns (Propane) for fire boom testing (F2152)

Oil Spill Containment Boom B/W ratio (F2682)





New potential standards

New standards being proposed to the ASTM F20 Committee:

- Collecting Skimmer Performance Data in Ice Conditions
- Advancing Skimmer Performance
- Full-scale Sorbent Protocol

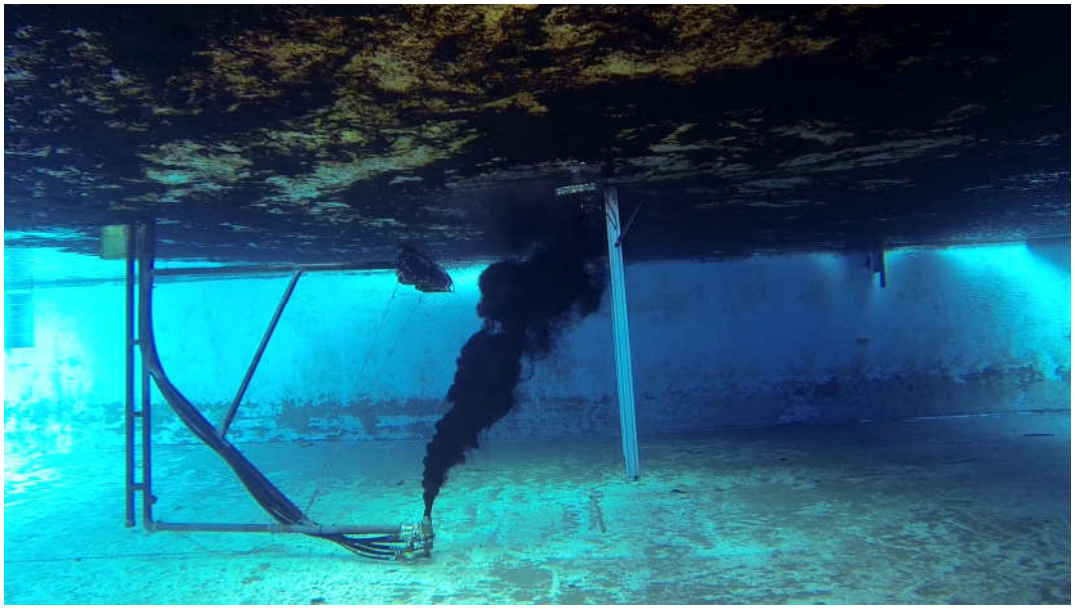
Dispersant studies for surface releases

Developed protocols for measuring dispersant effectiveness for surface releases

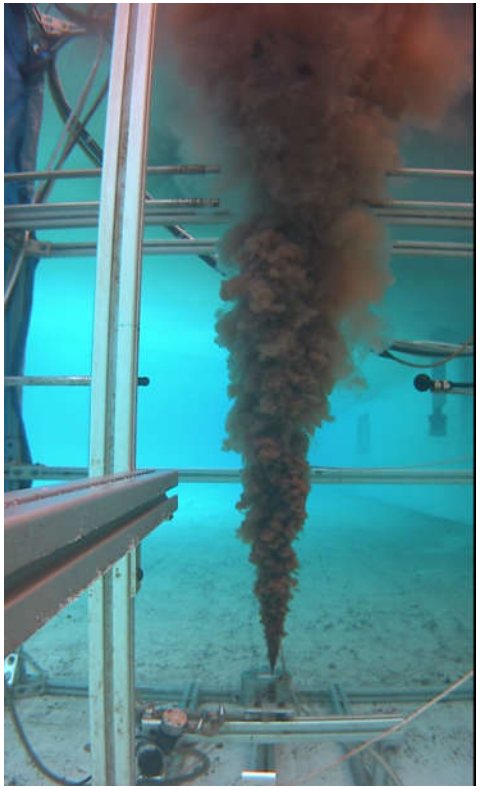
- Cold and temperate conditions
- Fresh and weathered crude and fuel oils

Dispersant studies for subsurface releases

Developed system for mixing oil and dispersant simulating deep water and subsurface releases



SINTEF Subsurface Release



ARA Subsurface release
Dorado Corexit 9500 DOR 1:50

Hands-on Oil Spill Response Training

- Classroom and ‘Hands-on’
- Recovery of real oil, not a surrogate material
- Students use full-scale oil spill recovery equipment
- Students operate the equipment in calm conditions and in waves to simulate ‘at-sea’ conditions
- Customized classes to meet customer-specific training needs

Oil Spill Response Training Classes

Oil Spill Response Strategies & Tactics Training

- Texas A&M National Spill Control School

Oil Spill Responder Training (OSRT) and SMART Training

- U.S. Coast Guard

Customer-specific training available

- Oil Spill Response Training (Custom)
  - Chevron Response Training
  - Alaska Clean Seas
  - Clean Harbors Cooperative
- Oil Spill Dispersant Workshop
  - American Petroleum Institute

Upcoming training at Ohmsett

Oil Spill Response Strategies & Tactics with Texas A&M

- May 14-17, 2019
- August 6-9, 2019
- www.ohmsett.com/registration.html

Oil Spill Responder by the USCG

- April 29 - May 3, 2019
- August 1-16, 2019

Oil Spill Response Training by Clean Harbors Cooperative:

- October 7-11, 2019
- October 21-25, 2019

Multi-partner remote sensing of quasi-natural weathered oil

Goals:

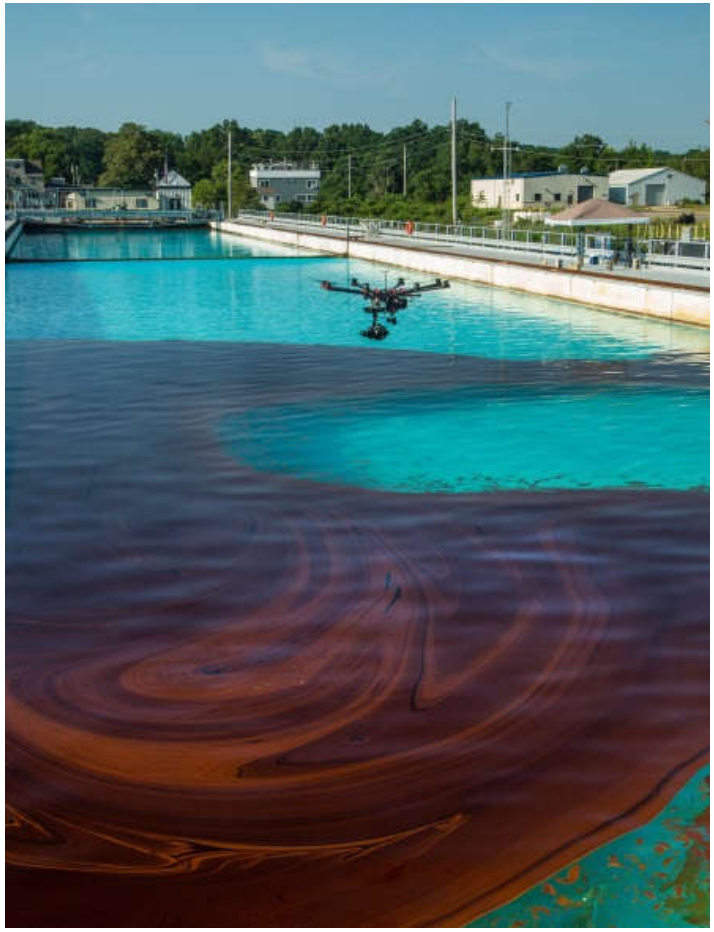
- Large scale progressive weathering of crude oil.
  - Evaporation, photooxidation, and emulsification
- Test multiple remote sensing modalities during progression of weathering.

Participants

- BSEE
- NOAA
- EPA
- Ocean Imaging
- WaterMapping
- Fototerra

Duration

- 3 weeks



Large scale emulsion generation

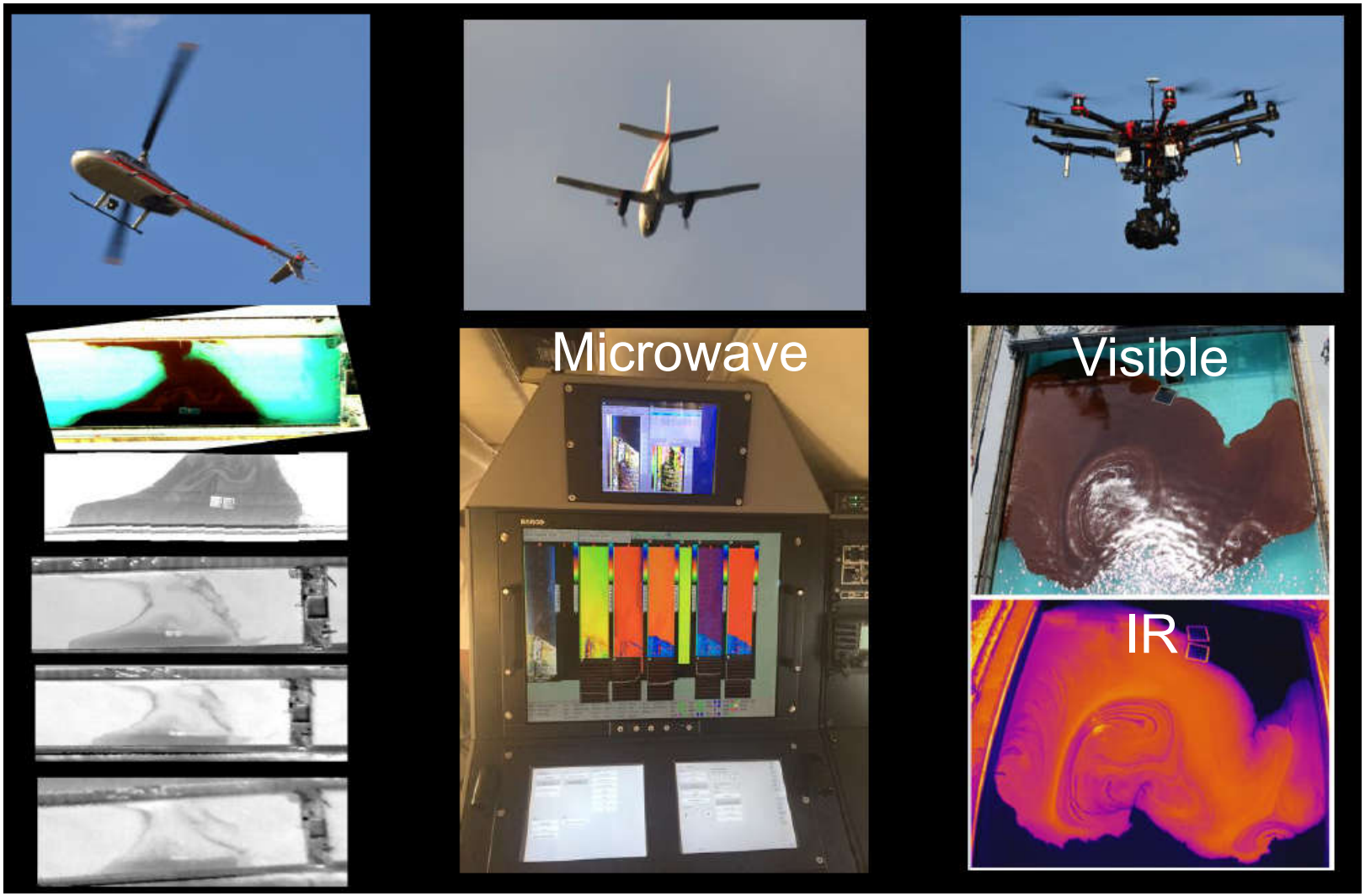
Hoops at multiple states of weathering

- Evaporation states: Fresh, 10%, 20%, 24% weight loss
- Photooxidized over 3 weeks
- Emulsions: over 80% water (Maintained with wave action)

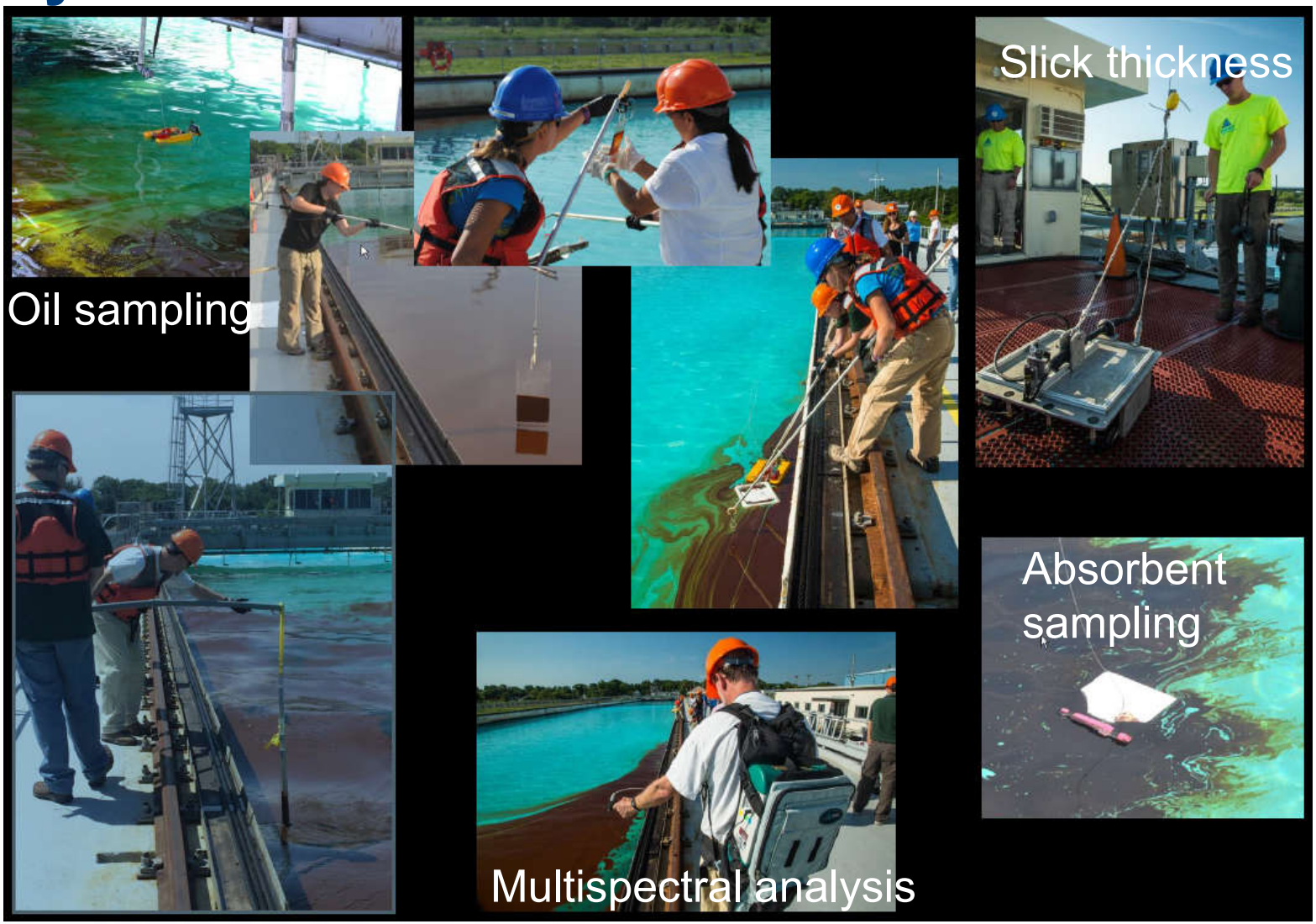
Ohmsett developed novel oil control methods

- Sprayers
- Boom
- Ice eaters
- Waves

Remote sensing platforms



Physical measurements of weathered oil



Results of weathering and future work

Remote sensing methods were studied and are under development

Stable emulsion can be formed on the Ohmsett tank as long as waves were active

Future work can now include systematic studies of weathering on the effectiveness of spill response tools on a large scale

- Evaporation
- Emulsification
- Photooxidation
- Sedimentation
- Biodegradation
- Dissolution
- Natural dispersion

Summary

At Ohmsett you can test with crude oils and waves to ASTM standards

Emulsion capability allows study of weathered oil spill response on a large scale

Custom experiments can be accommodated

Staff is highly capable

Contact us for tank time.

Five year refurbishment is scheduled for May 2020 through August 2020

Questions?

Paul D. Panetta, Ph.D.
Ohmsett Chief Scientist
ppanetta@ohmsettnj.com
(757) 771-3162

BSEE
Bureau of Safety and Environmental Enforcement

extras

Customers

Government agencies

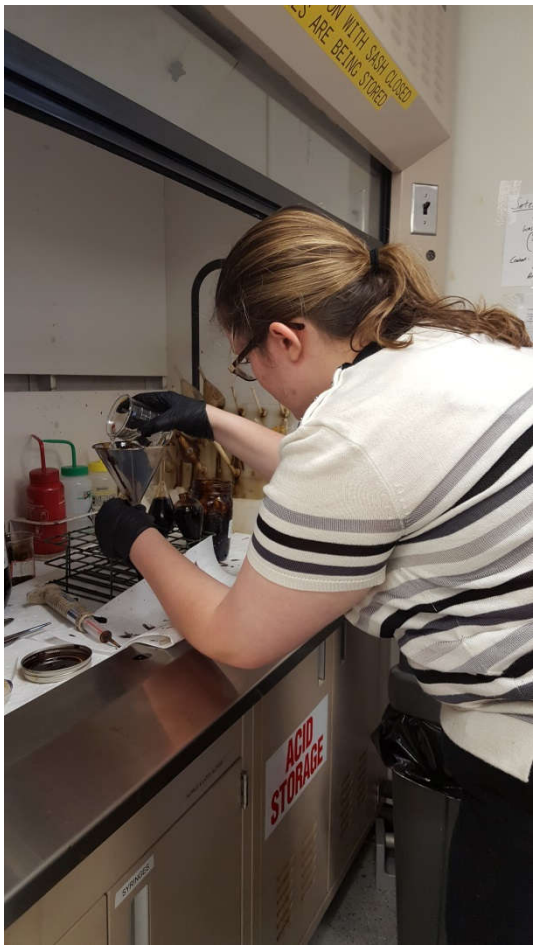
Academia

- Includes mentorship of local high school students enrolled in the STEM Program

Manufacturers

Researchers

Public and private companies



Recent R&D Projects

NOAA Oil Slicks and Emulsions Study

- Remote sensing systems using mobile platforms

EPA Bakken Crude oil study

- Mechanical recovery of oil
- Fate and behavior study

Remote Detection of Oil Spills

- Detect and map the thickness of an oil slick in real-time

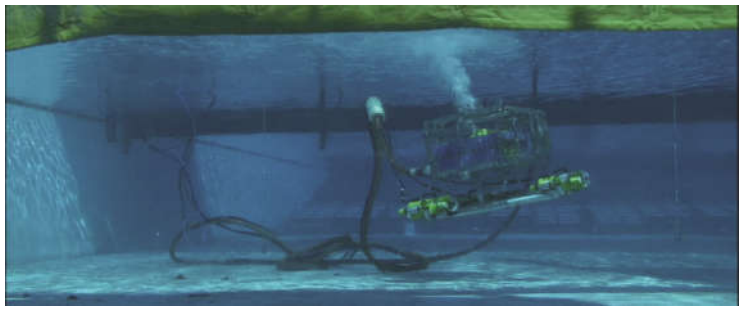
Dispersant Comparison Testing

- Cold water & Warm water

Recent R&D Projects

Autonomous Skimmer

- Automation and optimization of skimmer recovery operations



Submersible Skimmer

- Aid in mechanical recovery of oil in ice-infested waters

U.S. Coast Guard R&D Center Subsurface Oil Detection

- Detect heavy oil on sea floor
- Recovery of sunken oils
- Operate in all sea floor environments

Ohmsett

Research-Testing-Training