CLEAN GULF
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Advances in Sorbent Testing

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The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Product Schedule - Subpart J

- Subpart J is a section of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) which stipulates the criteria for listing and managing the use of dispersants and other chemical and biological agents used to mitigate oil spills
- The NCP Product Schedule was a result of a requirement from the Clean Water Act and the Oil Pollution Act of 1990 which requires the President to prepare a "schedule of dispersants, other chemicals, and other oil spill mitigating devices and substances, if any, that may be authorized for use on oil discharges..."
- The Environmental Protection Agency (EPA) prepares and maintains the NCP Product Schedule

What type of oil spill control products are listed on the NCP Product Schedule?

The Schedule includes chemical and biological agents that collect, remove, disperse or bioremediate oil. NCP Product Schedule categories include:

1) Dispersants - used to break up oil on the water's surface, causing it to disperse down into the water column where natural processes can degrade the oil droplets (used in Marine/Coastal waters).
2) Surface washing agents – only used on solid surfaces to lift and float oil to better absorb, vacuum or collect the oil.
3) Bioremediation agents - microbes, nutrients, enzymes, or a combination intended to encourage the degradation of oil.
4) Miscellaneous oil spill control agents (MOSCA) – including chemical based sorbents and solidifiers and products other than above categories.

What are Sorbents?

- Products that are comprised of simple organic, mineral, or synthetic materials
- Sorbents are inert and insoluble materials used to remove oil from water through absorption or adsorption
- After use, all sorbents must be removed from the water and disposed of properly

https://www.epa.gov/sites/default/files/documents/ncpfactsheet.pdf

How are Sorbents Tested?

Established standard methodologies, e.g., ASTM, Environment Canada

- From Environment Canada (1993), “A universally accepted, standard method for testing oil spill sorbents is not currently employed by the majority of sorbent vendors. Because of differences in the testing methodologies that currently exist, end users are limited to manufacturers' and distributors' claims which may be perceived as being biased.”

- ASTM International – ASTM F726-17
  Standard Test Method for Sorbent Performance of Adsorbents
  - This test method
    - Is to be used as a basis for comparison of adsorbents in a consistent manner
    - Covers laboratory tests that describe the performance of adsorbents in removing non-emulsified oils and other floating, immiscible liquids from the surface of water
  - https://www.astm.org/Standards/F726.htm

- Environment Canada
  Oil Spill Sorbents: Testing Protocol and Certification Listing Program
  - Categorizes sorbents according to their operating characteristics, i.e., oil spills on water, oil spills on land, and industrial use
  - Characteristics evaluated include:
    - Initial and maximum sorption capacities, water pickup, buoyancy, reuse potential, retention profile, material integrity, ease of application & retrieval
  - https://meridian.allenpress.com/iosc/article/1993/1/549/198842/OIL-SPILL-SORBENTS-TESTING-PROTOCOL-AND

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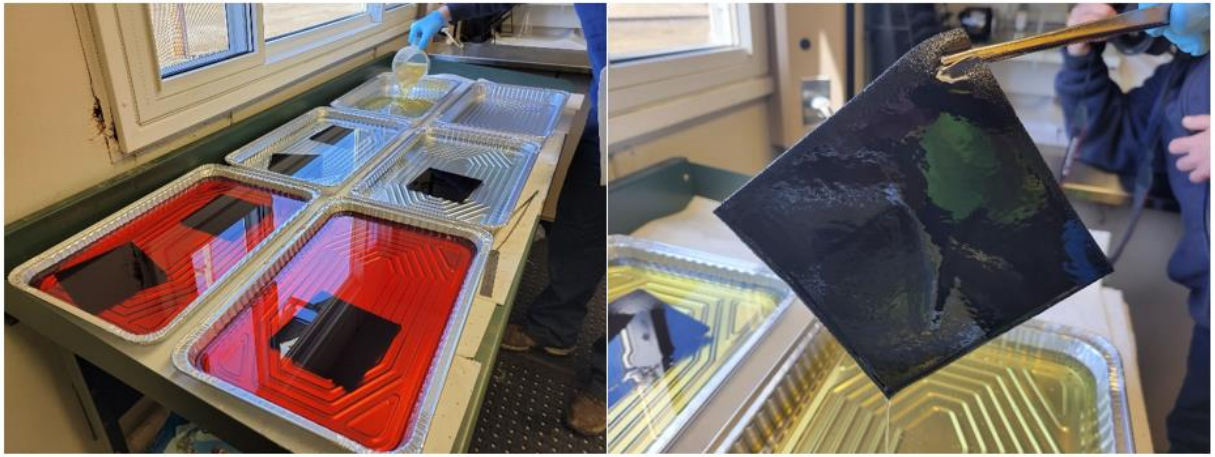
Ohmsett Lab-Scale Sorbent Testing

ASTM

- The provided sorbent material was cut into 13cm x 13cm sized samples and placed into aluminum pans with sufficient oil, per ASTM F726
- Weight measurements are taken after 15 minutes and 24 hours to determine maximum capacity and to provide an expected capacity baseline value for further testing

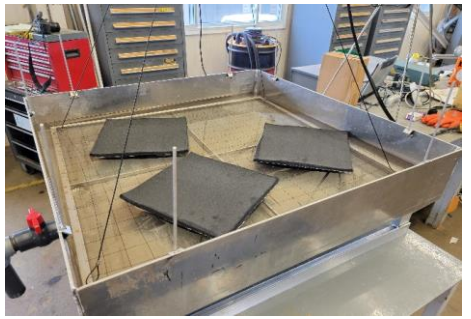


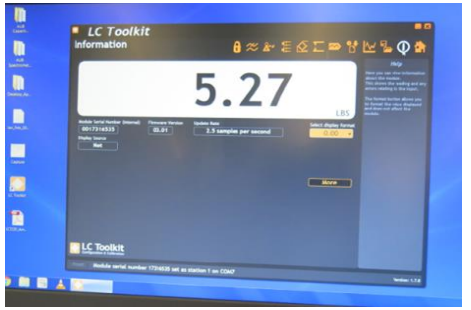
- A range of fluid viscosities was evaluated in order to provide a thorough understanding of sorbent performance
  - Diesel for a low viscosity example and light to medium crude oils for more viscous materials
  - Heavy crudes were not typically used since they tend to reside on the outside of the sorbent as a coating

Larger Scale Sorbent Testing

Test procedure for obtaining Maximum Oil Capacity :

1. Calibrate load cell / obtain support “dry rack” tare weight
2. Record sample sorbent dimensions
3. Place sorbent sample(s) on support rack
4. Record initial combined rack and sorbent weight
5. Place test fluid into tray to a depth sufficient to cover support rack plus approximately one inch
6. With sorbent sample removed, lower the support rack into the tray and withdraw after two minutes to obtain “wet rack” tare weight
7. Replace sample on rack and lower until sample floats freely on fluid surface
8. Begin timer and video / time-lapse documentation
9. After a preset time interval, begin load cell data collection and withdraw support rack and sorbent for determined duration before re-immersing sample in test fluid
10. Repeat load cell data collection at subsequent time intervals as necessary until conclusion of testing
11. Record values for test fluid retained in tray and recovered from sample



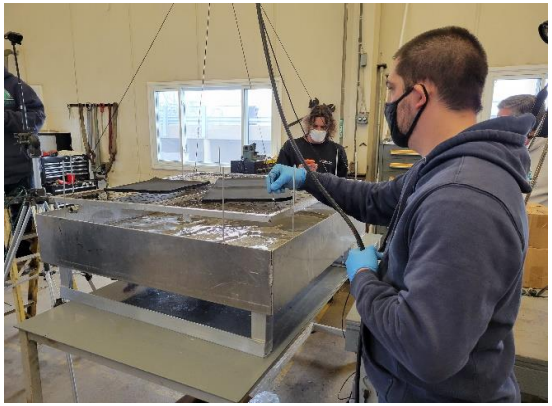


Larger Scale Sorbent Testing

Test procedure for obtaining Maximum Oil Capacity

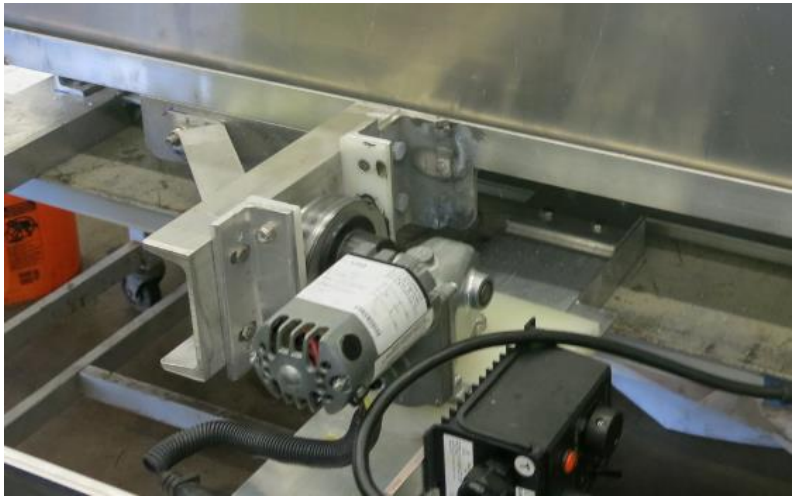
- Samples may be wrung out in order to evaluate potential loss of performance with repeated use

- While not a standardized test, this approach allows for the evaluation of materials of different sizes and geometries than that of ASTM F726



Potential Test Refinements

- **Currently being refined with respect to data collection points and drain time when removed from test fluid**
- **Additionally, the test rack may be oscillated via an eccentric drive**
  - The energy-capable test stand is equipped with a variable speed right-angle gear reduction, allowing for controlled speed in the range of 30-80 cycles per minute
  - The tray is supported on linkage to allow free movement with respect to the motor
  - The drive roller with an eccentricity of ½-in., provides a 1-in. overall stroke distance
  - During testing, speed is maintained at approximately 60 cycles per minute to provide surface waves approximately ½ in. high with a wavelength of 6 in.



- **Gentle agitation provides an opportunity to explore a broader range of potential real world conditions**

Thank You

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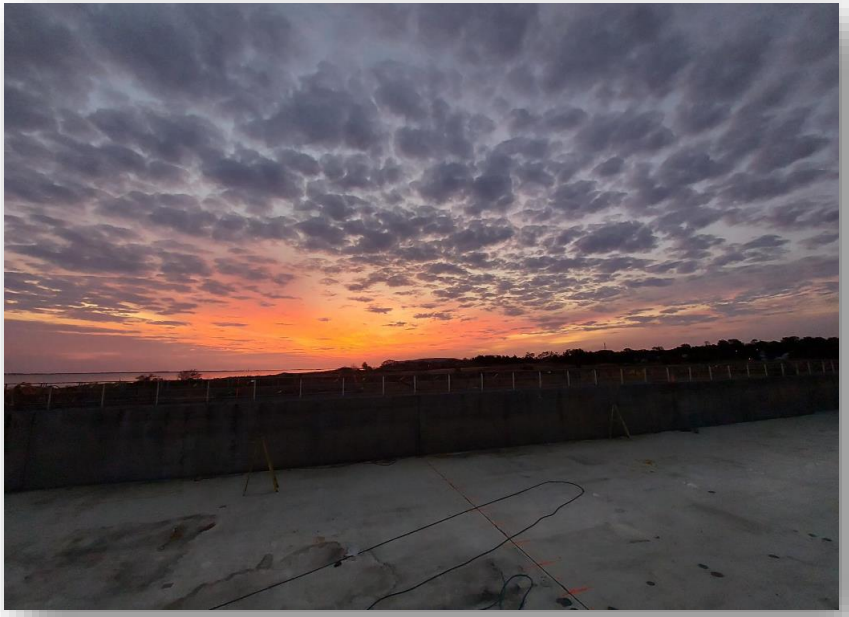

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