Tashima, Keith (ENRD)

From:	McMullen, Rebecca (ENRD)
Sent:	Tuesday, November 06, 2012 9:00 AM
To:	Tashima, Keith (ENRD); MacLaughlin, Jerry (ENRD); Levine, Bradley (ENRD)
Subject:	PUBLIC COMMENT (FW: Letter for Public Comment on New Bedford Harbor Cleanup)
Attachments:	Scott Smith Letter to Attorney General - New Bedford 11-5-12.pdf; Cape scientist Faux eelgrass will lower boom on oil spills CapeCodOnline.com.pdf; Synopsis of WHOI OPFLEX Synthetic Eelgrass Research .pdf

Another comment for AVX.

-Becky

Rebecca McMullen
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Environment and Natural Resources Division
Environmental Enforcement Section
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From: Scott Smith [mailto:ssmith@opflex.com]
Sent: Monday, November 05, 2012 6:45 PM
To: ENRD, PUBCOMMENT-EES (ENRD)
Cc: jamie roberts; Karyn Eldredge
Subject: Letter for Public Comment on New Bedford Harbor Cleanup

Please see attached letter and exhibits as to New Bedford public comment.

Best Regards,

Scott C. Smith
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Cell (508) 776-2995

Opflex Solutions

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Assistant Attorney General
U.S. DOJ - ENRD
P.O. Box 7611
Washington, D.C. 20044-7611
Via email - pubcomment-ees.enrd@usdoj.gov

Dear Attorney General,

My name is Scott C. Smith and I am the Founder and CEO of OPFLEX Solutions. From the polluted water of Upstate NY's 2006 flood disaster, OPFLEX technology was created. It worked then and it works even better now, after millions were put into research and development of the product. In 2007, Senator Schumer led a press conference with me about the contaminated flood water recovery efforts.

In 2010, I worked side by side with fishermen, coast guard personnel, and oil spill workers in the BP Deepwater Horizon oil disaster and improved the first approved and used Open-Cell foam that can remove from water PCB's, oil, oil sheens, and other related carbon contaminants.

In 2011, I donated product to New Bedford Harbor and prove the OPFLEX Environmental Indicators and related OPFLEX Technology's efficacy in fingerprinting, detecting, and removing oil and PCB's in the water.

The situation is complicated with the CAD cells in New Bedford and the community deserves a transparent way to know what is in their water and alternative ways to remove the contaminated sediment. If you are truly considering the use of CAD Cells that will take at least 6 years and $80 million, why is it that you have not considered the use of a safe, environmentally friendly, locally-created option that would cost UNDER $1 MILLION and, depending on manpower and deployment tactics, would take 3- 6 months?

OPFLEX Technology can clear the water of all the contaminants currently listed in New Bedford Harbor and OPFLEX Environmental Indicators can be used to detect what is in the water and fingerprint any pollutants. In order to remove pollutants, wouldn't it be helpful to know what they are and in what concentration they exist?

There needs to be careful consideration of all available technologies to remove the contaminants from the water in the Port of New Bedford, not just simply burying the contaminants and deferring the problem for the future generation.

I am working with scientists at the Woods Hole Oceanographic Institute in developing synthetic eelgrass, which is a viable and proven option for New Bedford to protect the harbor even if the CAD cells move forward. I have enclosed a White Paper from the scientists detailing its development and use.

I look forward to hearing from you.

Scott C. Smith
Founder and CEO
OPFLEX Solutions
ssmith@opflex.com

Prev Next

Cape scientist: Faux eelgrass will lower boom on oil spills

By Patrick Cassidy
pcassidy@capecodonline.com
September 26, 2012 - 2:00 AM

WOODS HOLE — Like a professor explaining a particularly delightful problem, Thomas Gray Curtis Jr. practically bounced from equation to equation on a blackboard in a small room at the Woods Hole Oceanographic Institution's Redfield Laboratory.

"I like to model things after nature," he said as he demonstrated why long strips of green foam reminiscent of thick eelgrass can sponge up oil and other pollutants.

See full article text

Curtis is a guest investigator at WHOI, studying ways to better protect the environment from oil spills, such as the one that devastated the Gulf of Mexico two years ago.

A retired engineer and former salvage diver with the Navy, he said he worked on the concept of a high-speed oil skimmer in the late 1960s and early 1970s. When he saw the lack of progress by the time of the Deepwater Horizon spill in 2010, he decided to jump back into researching the subject.

Curtis saw a centrifugal device championed by actor Kevin Costner as a potential way to separate oil and water gathered by his skimmer.

He was still in search of a material for the bottom of the skimmer that oil would adhere to readily when he came across a green foam called Opflex, manufactured by a company owned by Osterville resident and entrepreneur Scott Smith.

"I think he has a good product in the foam he is working with and I'm trying to help him use it better," Curtis said, adding that his research into its properties is not an endorsement.

Unlike a regular containment boom that floats only on the water's surface and allows oil to pass above and below it, the synthetic eelgrass is anchored to the bottom and extends throughout the water column and across the surface, creating not only a potentially effective barrier but also more surface area to adsorb oil and other pollutants, Curtis said. Adsorption is when a thin layer of molecules sticks to the surface of a solid or liquid substance.

The key to Opflex is a combination of several concepts: The foam is buoyant enough to float even when saturated with oil, Curtis said.

The saturation ratio of the foam, which dictates how much oil can be captured, is based on the amount of open versus closed cells in the material, Curtis said.

The more closed cells the greater the buoyancy. The more open cells the better the ability to adsorb the oil, much like a living sponge filters water for food.

Opflex's optimal saturation ratio is a work in progress but is already equal to 32 times the weight of the foam in oil, Smith said. "And we retain our buoyancy," Smith said. "We don't sink like the white booms."

Smith already has deployed versions of his foam in Bermuda, the Gulf of Mexico, Florida, Alabama, Louisiana and for a 2011 oil spill in the Yellowstone River, he said.

Testing on the foam already has revealed some unexpected results that could have local implications beyond the errant oil tanker or oily harbor, Smith said.

Independent testing by a Pennsylvania laboratory, for example, has shown the foam can reduce the amount of biological oxygen demanders, or BODs, in water by almost half, he said.

BODs can be a sign of excessive nutrients flowing from septic systems and other sources into local bays and ponds and may lead to fish kills. "There's something in there that consumes oxygen that is getting stuck on it and taken out," said Albert J. "Sandy" Williams III, a scientist emeritus at WHOI who works with Curtis and Smith.

Determining other potential uses for his synthetic eelgrass, including helping with the cleanup of local bays and ponds, is one of the reasons it's important to work with researchers such as Williams and Curtis, Smith said.

"We're simple, not magic," he said.

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1. Synopsis of Proposed Research

The proposed research will assess the properties of various formulations of the copolymer ethylene methyl acrylate (EMA) and determine if, and how, these properties can be varied in formation. Variations of EMA will be field tested at sea in oil spill interdiction and containment applications sensitive to these properties to determine how these properties impact the functioning of the applications.

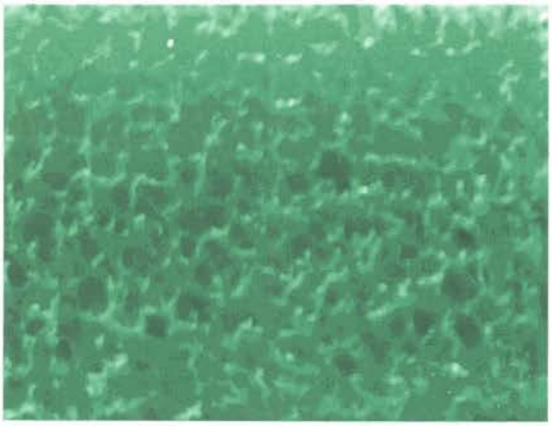
2. Background

Oil spills are not rare events. Natural seeps of oil have existed over recorded history, but catastrophic oil spills are much less common and have had devastating impacts on the ecosystems subjected to them. Repeatedly, oil spills have concerned the public, resulting in flurries of effort to contain the spills, and plan to avoid such catastrophic events in the future. As Wess Tunnell, Associate Director of the Harte Research Institute for Gulf of Mexico Studies, said, after the VLCC, the Aegean Captain and the Atlantic Empress, collided off the coast of Tobago on 19 July 1979, spilled more than 276,000 tonnes of crude oil into the sea: "If it's not in a popular place and there's not a huge outcry of the people that live in the area, probably not much is going to happen."[1] Unfortunately, in short order, the public's attention is distracted by another concern. Progress in solving the problems associated with oil spills is episodic.

The Exxon Valdez oil spill in Prince William Sound in 1989 illustrates this point. After she grounded on Bligh Reef, on 29 March, more than 11 million gallons of crude oil from the tanker inundated the ecosystems of the sound. The largest oil spill in United States history, to that time, captured the public's attention, and the Government acted. However, environmental conditions made spill cleanup less effective; some efforts were counterproductive. Congress passed the Oil Pollution Act of 1990, which mandated the US Coast Guard and oil companies maintain vessels for oil spill cleanup. As this added task was not funded, the Coast Guard has come to depend upon vessels of opportunity, to which they would supply some oil skimming equipment, to augment their "Black Hull" fleet, charged with maintaining aids to navigation. Some Coast Guard buoy tenders were equipped with Spilled Oil Recovery System gear to meet their expanded responsibilities.

However, as other issues captured the public's attention, the demand on resources for other ends increased, concern over the environmental impacts of oil spills waned. Research since the 1990s has improved understanding of the natural processes involved in oil spill behavior [2], and ecosystem recovery[3], but slowed considerably, until the Deepwater Horizon drilling rig explosion in the Macondo Prospect on April 20, 2010 rekindled the public's interest. Unprepared for the Deepwater Horizon oil gusher, technically, operationally, and emotionally, "experts", entrepreneurs, and the general public responded to the news of the catastrophic event with a plethora of suggestions, offers, and equipment to staunch the spill and clean it up, which were so numerous that assessment of them was difficult. Schemes proliferated. "Oil men" promoted the use of oil tankers for skimming oil. A variety of natural organic sorbents, such as hay and hair, were promoted to adsorb spilled oil, despite their limitations. Amidst the well-intended suggestions and ideas that were little more than flights of imagination, were some contributions with merit. Unfortunately, episodic development makes it difficult to integrate improvements into a highly effective emergency response system.

Anecdotal evidence would indicate that ethylene methyl acrylate could be used to improve the interdiction and containment of spilled oil. As EMA is oleophilic and hydrophobic, oil floating on water tends to adhere to a surface of EMA after coming in contact with it. EMA formed as an open cell foam has a large surface area to volume ratio, enabling it retain significant amounts of oil per unit volume. Figure 1 shows a close-up view of such foam and small sample of it saturated with oil from which water is not retained.



(a) **Figure 1: Open cell foamed EM** **(b)**

open cell structure

water dripping from EMA sample while retaining oil.

These properties and its low density are observed from demonstrations made by Scott Smith, the CEO of Opflex Solutions, the manufacturer of this open cell foam, in his efforts to interest those cleaning up the oil spill in the Gulf of Mexico in using his product. To take full advantage of the open cell foam structure, Smith fabricated EMA foam strips into foam "mops". Two lengths of "mop" are shown in Figure 2, secured at the seas edge. Initially green, the "mops" darken as oil is adsorbed onto their surface.The green "mop" had not been in position long enough to adsorb a significant amount of oil. Oil can be recovered from "mops" saturated with oil by squeezing it out of them.

Figure 2
Scavenging oil from the sea.

In the Gulf, the most prevalent barrier to oil inundation seems to have been cylindrical booms made of synthetic sorbents such as polyurethane, polyethylene, and polypropylene, although they seem to be only marginally effective. Pads of EMA open cell foam, seen in Figure 3 floating on the surface within, not outside, a containment boom, are discoloured by the oil they have adsorbed. EMA has advantages over natural sorbents, which are harder to collect, once applied, have a tendency to sink once oil is absorbed or adsorbed. In addition, the open cell foam structure of EMA can sequester many more times its weight of oil than natural sorbents.

Figure 3: Floating EMA sorbent.

The copolymer has normally consisted of 20 percent methyl acrylate. However there may be a copolymer formulation for which oil has a greater affinity. Although not tested rigorously, a sample of EMA fabricated with 24 percent methyl acrylate suggests this variability.

EMA is light of weight. The specific gravity of EMA is approximately 0.94, which makes EMA intrinsically buoyant. This will vary some, depending upon the amount of cross-linking. The buoyancy of the foamed formation of EMA could be varied considerably, depending upon the ratio of open to closed cell volume. This capability of adjusting the buoyancy of EMA makes it versatile and useful in a variety of applications for oil interdictio and containment.

3. Proposed Research

The objectives of this proposal are to:

1) assess the properties of various formulations of the copolymer ethylene methyl acrylate,
2) utilize this material in various configurations to improve the interdiction and containment of oil spilled in the sea,
3) test these configurations to establish their behaviour in the marine environment, and

4) alter the properties as found necessary to reach a more optimal material.
5) publish the results of this materials investigation, including presentation at the OES 2012 Conference

Toward these ends, The Woods Hole Oceanographic Institution (WHOI) will collaborate with the Opflex Solutions LLC. Opflex Soltions LLC, as the principal developer of foamed ethylene methyl acrylate (EMA), for various markets. Mr. Smith, holder of the patents for foamed EMA, and Opflex Solutions are particularly interested in the use of EMA for oil cleanup, and has a vested interest in finding the optimal composition of this copolymer, for use in oil spill impact mitigation.

WHOI will integrate this EMA material in the design of oil spill interdiction and containment equipment to take optimal advantage of the material properties. Testing of these designs will be done at Woods Hole and at Barataria Bay, in Louisiana. The testing of the designs in Louisiana will be done by Opflex Solutions LLC and reported to Woods Hole.

Based on the field test performance of the designs, attempts will be made to adjust material composition, as necessary or desired to optimize performance, or to introduce design changes to take full advantage of the material and thus improve performance. This research and development will be iterated as necessitated, up to twice.

a. Woods Hole Oceanographic Institution will design at sea tests of the EMA materials provided by Opflex Solutions. The designs will be based on properties measured after formation, which include: density, surface tension with crude oil, amount of cross-linking, copolymer proportions, cell size, percentage of open cells. The results of these tests, sensitive to the synergy among material properties, will be used to suggest variations in EMA formulation, to be made by Opflex Solutions, to optimize the use of the material in scavenging, interdiction and containment of spilled oil.

   The at sea tests will be made of a synthetic kelp and a containment boom, fabricated from EMA. These configurations of EMA were conceptually, identified in the white paper: "Oil Scavenging with Ethylene Methyl Arcylate", which is attached. It is expected that the behavior of the synthetic kelp will be particularly sensitive to surface tension, and density. The containment boom performance will probably depend more on cross-linking and cell size. Their performance may enable improved design of the test equipment, and, in either case, provide serendipitous insights.

   In consultation with Opflex Solutions, based on the results of tests at sea, different formulations will be made to produce EMA with more desirable properties, which will subsequently be formed into synthetic kelp and containment booms for testing at sea. This recursive process be repeated twice.

Task Structure

Opflex Solutions LLC will supply WHOI with EMA of varying properties, creat changing the formation parameters, x_i. $x_i \in [\lambda, \pi, \varepsilon, \omega, \delta, \mu]$, the independent variables: λ, pe cross-linking; π, percent of alkyl acrylate (usually methyl acrylate); ε, foam cell size; ω of open cells; δ, foam thickness; and μ, melt index. The set of EMA properties, P_i, of partic t are $P_i \in [\rho, \alpha, K, \tau]$,

where: ρ is the density,

α is the adhesion of oil,

K is the bulk modulus

τ is the durability.

$$dP_i = \frac{\partial P_i}{\partial \chi_j}\, d\chi_j, \qquad j = 1 \cdots 6$$

Opflex Solutions LLC will supply WHOI with EMA of varying composition. The composition will depend upon the percentage of methyl acrylate, π, in the copolymer, the percentage of open cells in the foam, ξ, the cell size, χ, and the thickness of the foam, δ. It is to be determined how the buoyancy, $\boldsymbol{\rho}$, surface tension, $\boldsymbol{\sigma}$, durability, $\boldsymbol{\Delta}$, and longevity, $\boldsymbol{\tau}$, of EMA are influenced by changes in composition. Durability will be a measure of how well EMA stands up to dynamic forces. Longevity relates to the time before properties degrade.

$$dp_i = \frac{\partial p_i}{\partial x_j}\, dx_j$$

Initially, Opflex Solutions will provide three samples each of EMA based on alterations the formation parameters. Generically, if a parameter as currently fabricated are denoted by $\boldsymbol{P_o}$, then, in addition to a sample as currently fabricated, samples will be provided which have values greater than and less than this prevalent value. Rather than provide all permutations of possible formation parameters, all parameter values, except that parameter being changed will be provided as currently manufactured.

Synthetic kelp and a containment boom will be assembled at the Woods Hole Oceanographic Institution from the samples of EMA initially provided by Opflex Solutions, and deployed at Woods Hole before being shipped to Bay Jimmy, a set-aside marsh in Barataria Bay, Louisiana for testing in an oil contaminated ecosystem.

Based on the field test results from deployment in Barataria Bay, the Oceanographic Institution will assess, in collaboration with Opflex Solutions, what changes might be feasibly made to improve the efficacy of EMA to interdict, contain, and sequester spilled oil.

Task Execution

a. Any additional data that will allow us to get more insight into your understanding of the issue, and how you will accomplish the individual tasks(s) listed in your White Paper. If your White Paper did not break the work into specific tasks, please do so in your proposal.

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b. A brief discussion to support appropriateness of all research methods to be utilized under these efforts;

There are many factors which determine the efficacy of equipment design, some of which are not obvious. The deploying and recovery of equipment at sea subjects it to loads and handling problems inadvertently overlooked in design.

Although research has been conducted to determine the relative oleophilic and hydrophobilc characteristics of an ensemble of materials [4], EMA was not included among those tested. The anecdotal evidence would indicate that this promising material should be evaluated.

The iterative approach that will be taken will enable the designers to make modifications, to take advantage of the results of field tests, and any synergies, to maximize the benefits of EMA properties.

Sorbent material, deployed in the Gulf of Mexico to protect Louisiana coastal wetlands seemed to be only marginally effective. Figure 1 shows a floating sorbent barrier made of a closed cell foam, encased within a skin. This embodiment of the foam, does not have the desirable high exposure to the oil in the environment that an open cell foam of EMA has.

Toward these ends, The Woods Hole Oceanographic Institution (WHOI) will collaborate with the Opflex Solutions LLC. Opflex Soltions LLC, as the principal developer of foamed ethylene methyl acrylate (EMA), for various markets. The are particularly interested in the use of EMA for oil cleanup, and has a vested interest in finding the optimal composition of this copolymer, for use in oil spill impact mitigation.

Opflex Solutions LLC will supply WHOI with EMA of varying composition, i.e. physical properties such as density, foamed EMA with different proportions of open cell structure and cross-linking. This material will be accompanied by testing reports documenting the properties of interest.

WHOI will integrate this EMA material in the design of oil spill interdiction and containment equipment to take optimal advantage of the material properties. Testing of these designs will be done at Woods Hole and at Barataria Bay, in Louisiana. The testing of the designs in Louisiana will be done by Opflex Solutions LLC and reported to Woods Hole.

Based on the field test performance of the designs, attempts will be made to adjust material composition, as necessary or desired to optimize performance, or to introduce design changes to take full advantage of the material and thus improve performande. This research and development will be iterative. It is planned to have three iterations.

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[1] Carly Gillis, "Atlantic Empress and Aegean Captain Oil Spill: A Brief History", Huffington Post, http://www.counterspill.com/article/atlantic-empress-and-aegean-captain-oil-spill-brief-history, September 17, 2011

[2] Merv F. Fingas, The Evaporation of Oil Spills: Development and Implementation of New Prediction Methodology, International Oil Spill Conference, 1999, Paper #131

[3] David Sell, "Scientific Criteria to Optimize Oil Spill Cleanup", Aberdeen University Research and Industrial Services, Ltd., www.iosc.org/paper_poster/01965.pdf, 1995