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Using Dispersants For The Deepwater Horizon Oil Release – An Exercise In Risk Benefit

The use of dispersants to assist in the remediation of oil releases is not new - dispersants were used to disperse an oil release in the Gulf of Mexico in 1979 and then again on the Exxon Valdez oil spill in Alaska in 1989. As a practical matter, the use of dispersants is restricted under the National Oil and Hazardous Substances Pollution Contingency Plan, which established agreements among regulatory agencies to allow timely decisions relative to dispersant application.

Traditionally, dispersants have been used to effectively dissipate oil from the sea surface. At the surface, dispersants and oil form water-soluble micelles that eventually dissolve in the water column. Dispersants include a variety of surfactants. For example, in the COREXIT® product line, the primary surfactant is Dioctyl Sulfosuccinate Sodium Salt (DOSS). DOSS, which has two identical branched octyl groups that give this surfactant its ability to attract and hold major components of crude oil, is used in many common consumer goods such as deodorants, laxatives, stool softeners, and other personal care products.



A C-130 Hercules from the Air Force Reserve Command's 910th Airlift Wing drops an oil-dispersing chemical into the Gulf of Mexico as part of the Deepwater Horizon Response effort. (Source: US Air Force via Wikipedia.)

The more polar carbon-oxygen pairs in the succinate and sulfur-oxygen pairs in the sulfonate groups keep the micelle dispersed in water. Another important aspect of this surfactant is the sulfonic acid group, which is a strong acid that is readily dissociable in water. When released into seawater, the sodium salt ionizes to sulfonate, thereby enabling the dispersant to act as a "piggyback" to dis-

solve crude in the water column. In the case of the Deepwater Horizon crude oil release, the use of the dispersant at the source of the well-head leak represents a novel approach - it effectively reduced the amount of oil reaching the surface using less dispersant than if the oil did reach the water surface. The US Coast Guard and US EPA authorized the use of dis-

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persants underwater at the source of the Deepwater Horizon leak. Since July 19, 2010, shortly after the well was capped, there was virtually no additional dispersant application.

Extensive research has been done on the biodegradation of Louisiana Sweet Crude Oil since the Deepwater Horizon oil release. This type of oil is considered a "light" crude oil and is known to degrade at a faster rate than heavier weight oils from other locations, such as Alaska. Some recent studies suggest that the half-life for Louisiana Crude is 12 - 70 days in seawater. Furthermore, recent US EPA research suggests that the rate of biodegradation increases almost 50%

when dispersant is used. In other words, it takes longer for non-dispersed crude oil to biodegrade than either dispersed crude oil or the dispersant itself.

Shortly after the application of dispersants on the Deepwater Horizon release, various academic and action groups voiced concerns through the media about possible dispersant toxicity. On August 2, 2010, the US EPA released results of a study in which eight dispersants were tested and shown to have similar toxicities when mixed with Louisiana Sweet Crude Oil. These study results confirm that the dispersant used in response to the Deepwater Horizon release, when mixed with oil, is generally no more or

less toxic than mixtures with the other available alternatives. Perhaps more importantly, these US EPA results indicate that dispersant-oil mixtures are generally no more toxic to the aquatic test species than oil alone.

It is important to understand that the use of dispersants, when remediating oil releases, is a risk/benefit trade off. In the case of the Deepwater Horizon release, US EPA published research demonstrates that the dispersants that were applied were generally less toxic than the oils that they were intended to break down. ■

Remembering Our Colleague, Pat Conlon

Patrick A. Conlon, a Senior Quality Assurance Chemist at Environmental Standards, Inc., passed away unexpectedly on August 24, 2010, in Houston, Texas.

Pat, a resident of Manahawkin, New Jersey, was born December 9, 1952, in Passaic, New Jersey. He grew up in Allendale, New Jersey, and summered in North Beach Haven before moving there full time in 1968. He and his family divided their time between a home in Manahawkin and a condo in Barnegat Light. He was a communicant of St. Francis Church, Brant Beach.

Pat was a high school graduate of Strake Jesuit Academy in Houston, Texas; he received a Bachelor of Arts Degree in Education from Rutgers College and a Bachelor of Science Degree in Chemistry from Stockton State College (New Jersey). Pat received a Master of Science Degree in the Business Administration Executive Program from Rutgers University.

Pat was a member of the Environmental Standards Chemistry Quality Assurance Department for over 5 years; he was a highly proficient analytical chemist and quality assurance scientist. He worked in the chemistry quality assurance and analytical testing industry for

over 25 years and had a broad knowledge of analytical technology, computer systems, quality systems, laboratory process management, project planning, and general problem-solving. Pat participated on The NELAC Institute (TNI) expert committees for the past 10 years and was a member of the Field Activities Committee and the NELAC Advocacy Committee. In addition, he was a certified laboratory assessor for both organic and inorganic chemistries.

"Pat will be sorely missed by his colleagues at Environmental Standards and throughout the environmental analytical industry," commented David Blye, President of Environmental Standards, Inc.

"Pat always made time for me," said Ann Marie Gathright, one of Pat's fellow employees in our Virginia Office. "He was patient with me when I asked questions. He was never rude or dismissive. I made him smile. He made me smarter. I will always be grateful to him for his friendship and mentoring. Pat Conlon was one of the good guys in the world. I'm going to miss him."

Prior to joining Environmental Standards, Pat served as a Laboratory Technical Director for TestAmerica Pittsburgh and was directly responsible for technical development of the laboratory, including



Pat Conlon enjoyed taking photos along the beach near his condo in Barnegat Light, New Jersey. This photo of an Oyster Catcher was taken by Pat.

problem-solving and solutions to unusual project needs. Previously, as the Manager of the Information Technology Group, Pat was directly involved with the development and improvement of the laboratory information management systems.

Pat is survived by his beloved wife Constance, his daughter Tara, four step-children, and five grandchildren. He is also survived by two sisters and two brothers.

Environmental Standards is in the process of starting a memorial scholarship fund in honor of Pat. For more information about the scholarship, please contact Human Resources Manager Gail Benkovic at gbenkovic@envstd.com or 610-935-5577. Further information will also be posted on our website, www.envstd.com, and distributed to our electronic mailing list. ■

“Green” Applications For Your Mobile Phone

Director of Business Development Kevin P. Renninger, P.E., shares his experience with “apps” for mobile phones.

A purest would argue that any electronic device could never be defended as “green.” Admittedly, their position is defensible, especially in light of the alarming rate at which our landfills are receiving yesterday’s gadgets outdated by today’s revolutionary devices.

After clinging to my previous and highly protected cell phone (with phone features only) for nearly 4 years, I finally caved in and entered the world of 3G – that is, the third generation of cell phones with 4G already on the loose.



My new singular device now serves as many. Beyond a phone with infinitely more capabilities than the computer on Apollo 11, this tiny handheld device is a camera, a navigation system, an mp3 player, a calculator, a flashlight, and a mini personal computer. Technology has advanced so quickly that the resolution of pictures is now greater than that of my 3-year-old digital camera and the navigation features are greater than that of my 2-year-old GPS device. Therefore, one could argue that the consolidation of all of the electronic components into one is in of itself a step in the right direction for our planet.

With this new device comes the introduction to mobile applications (apps). My initial reaction to downloading my first app was akin to “Ralphie’s” reaction on Christmas morning when he unwrapped the Red Rider BB Gun hidden behind the Christmas tree. “Warning,” I noted to myself - playing with these applications can be addicting. In fact, the discovery of some applications is so enlightening that you feel the need to share your amazement with all of your friends. Check this out, I can read a bar code of a product in Best Buy and find out the price of the same item in stores within a 10-mile radius of where I am standing - all for free!

So, below are five “green” apps that I have found and would like to share in the hopes that you may find them useful. If you have identified a green app, I encourage you to let us know, and we can get the word out in a future edition of *The Standard*.

US Traffic

There are many versions of this free apps, but the concept is simple and the personal and environmental benefit is enormous. Quite simply, it provides real-time information on the location of an accident, thereby enabling you to re-route or avoid travel altogether. If we could only quantify the air emissions benefits.



Eco Lamp

Eco-lamp places at your fingertips the ability to calculate the environmental benefit of replacing incandescent bulbs with the LED or florescent lamps of equivalent luminescence. With a few taps, you will see the equivalent amount of coal (kilograms), natural gas (cubic meters), and oil (liters) that you are saving by making the swap. You will also see the reduction of carbon emissions (cubic meters) and number of bulbs that you will have saved over the lifetime of your new lamp.



Key Ring

Carrying multiple membership bar codes on your key chain or wallet? Eventually, there will be no need for your favorite grocery store, electronics store, or gym to clutter the world with plastic cards for you to lose or throw away. Rather, they will simply issue you an electronic bar code for you to carry in your cell phone. Have an existing card? Simply scan it in with Key Ring in seconds. It is actually fun to watch the scanning recognition process work!



Table of Elements

For the geeks like me among our readership, this is a handy tool to have within arm’s length. In addition to listing ALL of the properties about the elements, there are fun quizzes that can test your recollection of the elements. It helped my



son get an A+ on his recent high school chemistry test.

Pandora

OK, maybe I am stretching here touting Pandora as a green mobile app. However, it did save me from purchasing an mp3 player. Pandora provides streaming digital music from any of your favorite genres - all for free. Hitting the thumbs up or thumbs down icon for the songs streaming into your phone trains the station to play only the artists and songs that make your day. ■



Laboratory News

Lancaster Laboratories, Inc. Adds Dioxin and Furan Analytical Capability

Lancaster Laboratories, Inc. in Lancaster, Pennsylvania, has announced its newest service offering - dioxin and furan testing. The new dioxin and furan laboratory is equipped with two Thermo Scientific DFS HRGC/HRMS systems and a dedicated dioxin/furan sample preparation area. ■

New York Laboratory Acquisition

Pace Analytical Services, Inc. (Pace) of Minneapolis has acquired Northeast Analytical, Inc., an environmental testing laboratory that has worked on the Hudson River dredging program. The New York facility will reportedly remain at its current location in Schenectady at 2190 Technology Drive in the Tech Drive Business Park. Pace is the nation’s second-largest environmental testing company; Pace purchased Alpha Omega Environmental Laboratory LLC in Columbus, Ohio, at the beginning of the year. ■

ACL Cobalt Changes In Virginia Impacting Solid Waste Sites

Last year, the Virginia Department of Environmental Quality issued the first revision to the health-risk based Alternate Concentration Level (ACL) table since October 2007. The updated table was published on the web on the Department's Solid Waste webpage (www.deq.state.va.us/waste/solid.html) and became effective on the date posted. These revised ACLs were based upon the updated "Guidance to Calculate Health-Based Alternate Concentration Limits Using REAMS for a Solid Waste Facility." The ACLs were calculated using data provided by the Oak Ridge National Laboratory, which has taken over the update and maintenance of the RSL (previously known as EPA Region 3 RBC) table.

Not surprisingly, a significant number of changes in concentration levels occurred when comparing the new table to the October 2007 table. According to the Department, the changes reflected

modifications to: toxicity values (affects 33 chemicals); addition or removal of toxicity values (affects 9 chemicals); and increases in significant digits (affects 17 chemicals).

At the time the changes were announced, the Department noted that constituents whose changes will likely affect many landfills across the Commonwealth include chloroethane (ACLs raised significantly) and cobalt and naphthalene (ACLs lowered significantly).

Facilities that participated in the 2007 "state-wide" ACL Variance, or that had ACL Variances approved after May 2007, could begin using the new concentration levels as soon as the revised table was posted. Since adoption, groundwater sampling events that took place after the date on which the revised table was posted began to compare the concentrations included on the new table.

Our experience suggests that one of the most important changes has been the modification of the ACL for cobalt. A naturally occurring element found in the environment world-wide, cobalt-based blue pigments have been used since ancient times for jewelry and paints and to impart a distinctive blue tint to glass; the color was later thought by alchemists to be due to the known metal bismuth. At the same time, miners had long used the name Kobold ore (goblin ore) for some of these minerals. These were named for problematic earth-spirits because they appeared to be ores of copper or nickel; simple smelting yielded no metal but did emit poisonous fumes. In 1735, such ores were found to be reducible to a new metal (the first discovered since ancient times) that was ultimately named for the Kobold. Today, some cobalt is produced specifically from various metallic-lustered ores (e.g., cobaltite [CoAsS]); the main source of the element is as a by-product of copper and nickel mining. The copper belt in the Democratic Republic of the Congo and Zambia yields most of the cobalt metal mined worldwide.

Cobalt, in proper concentrations, is an essential trace element for all animal organisms - as the active center of coenzymes called cobalamins. These include vitamin B12, which is essential for mammals. Cobalt is also an active nutrient for bacteria, algae, and fungi.

Although naturally occurring and generally useful in various products and consumer goods, numerous solid waste facilities throughout Virginia are now wrestling with cobalt ACL exceedances. Past detections of cobalt that were well below the prior ACL, with no change in concentration, now far exceed the new standard.

Environmental Standards is assisting our Virginia solid waste clients with compliance issues arising from the new groundwater cobalt ACL standard. At the moment, nature and extent studies and assessments of corrective measure are underway at facilities throughout the Commonwealth; if your facility is having cobalt compliance challenges, please contact Phil McKalips at our Charlottesville, Virginia, office (434) 293-4039. ■

Laboratory Fraud Remains Prevalent In The Industry



A second incident involved an environmental consulting firm and a laboratory in Connecticut. Two men pleaded guilty to falsifying laboratory reports and/or using phony reports in a scheme to justify unnecessary soil removal.

Yet another incident involved the US EPA "raid" (September 2010) of a laboratory near Syracuse, New York. The Agency executed a search warrant in response to allegations of data fraud and improper waste removal. According to the firm's owner, "Over 90 percent of what we do here is called CLP (contract laboratory protocol) deliverables. That's courtroom-ready data that we have to supply to our clients." This investigation is on-going.

Contact Principal Chemist David R. Blye, CEAC, at 610-935-5577 for information about how to protect your firm with the third-party data validation and quality assurance services offered by Environmental Standards. ■

The issue of fraudulent environmental laboratory activities has been well documented in *The Standard*. Two recent prosecutions that involve the submission of false reports indicate that deliberate fraud in the environmental community is not "dead." The owner and the technical director of Blue Marsh Laboratories in Douglassville, Pennsylvania, have been charged with falsifying data on 300 certificates of analysis between 2005 and 2008.

It MUST Be True

We all know that the Internet is a terrific source of information, but during the height of the Deepwater Horizon oil spill response, the Internet became literally alive with misinformation, purported facts, and virtually every opinion possible. As a scientific consulting firm with a professional staff of more than 80 chemists, geoscientists, and environmental professionals, we at Environmental Standards watched with interest the explosion and emergence of so-called environmental experts willing to share their thoughts and concerns regarding the Summer 2010 events in the Gulf of Mexico.

Our favorite blog entry from the summer came from a member of the press in San Francisco, California. The blogger's concern? COREXIT® – one of the surfactant/dispersants used to break up the oil as it was released from the well prior to capping (see associated article on Page 1). The blogger, a reporter for a major San Francisco newspaper, sensationally stated:

"The question to which no one knows the answer is how Corexit reacts...It is a difficult question because there are hundreds of variables at play - Examples are pressure, water salinity, temperature, light, bioaccumulation, wave action, so many others and the hardest... time."

So far so good, we thought, until we spotted this frightening addition toward the end of the commentary:

"I was disturbed to get another anonymous tip that Corexit 9500 also has Dihydrogen Monoxide but I can't confirm this because Nalco will not reveal if Dihydrogen Monoxide [(DHMO)] is in fact

a secret ingredient in Corexit 9500. At any rate, more information is good and if DHMO is in Corexit, it's really bad and nasty stuff. It mutates DNA, denatures proteins, disrupts cell membranes, and chemically alter critical neurotransmitters. The atomic components of DHMO are found in a number of fun stuff such as caustic, explosive and poisonous compounds such as Sulfuric Acid, Nitroglycerine and Ethyl Alcohol."

DMHO has the more recognizable chemical formula H_2O . Indeed, most of us, even the non-chemists, will recognize that chemical formula as water. It is true that large quantities of water can be toxic, but we are not sure if its presence in COREXIT 9500 makes the surfactant "bad and nasty stuff."

Some may harbor other opinions, but at Environmental Standards, we believe that DMHO is beneficial, and we stand behind that belief with a fairly large and consistent body of scientific information to support this belief. If you disagree, we invite you to tell us why.

Our point in the discussion of this blogger's concerns over DMHO (a "secret ingredient") as a problem in COREXIT is to remind ourselves that not everything we read should be taken at face-value without challenge. The Gulf of Mexico oil spill was an unfortunate accident, the loss of life was tragic, and the environmental impacts will be assessed and addressed for some time in the future. But a little less sensationalism and a little more accuracy relative to the event would be most appreciated by all of us – scientists and non-scientists alike. ■

National Brownfields Conference To Be Held In Philadelphia



The 14th Annual National Brownfields Conference (Brownfields 2011) will be held in Philadelphia April 3 - 5, 2011, at the Philadelphia Convention Center. The conference, which is held in a different US city every 12 to 18 months, is the largest, most comprehensive gathering of local, state, and federal government officials; economic redevelopment authorities; academic community members; legal professionals; and real estate and environmental professionals. The conference focus is on the collaboration of environmental revitalization and economic development of the attendees' communities.

"The National Brownfields Conference in Philadelphia will explore initiatives to breathe new life into abandoned properties, rebuild tax bases, and provide valuable employment opportunities," said US EPA Regional Administrator Shawn M. Garvin. "As the largest and most comprehensive Brownfields conference in the nation, it provides an outstanding opportunity for attendees to learn about green jobs, green technology and emerging solutions for community revitalization, and sustainability."

First held in 1996, the conference has grown from approximately 400 attendees that first year to an expected 4,000 this year. Philadelphia is the latest city to join the host of conference cities, including Chicago, St. Louis, Dallas, Detroit, Los Angeles, Denver, Boston, and New Orleans, to name a few. Read more about the conference at www.brownfields2011.org. ■



Environmental Standards Brownfields Project Nears Completion

The opening of one of the Philadelphia Region's long-awaited commercial Brownfields facility is about to happen. Originally due to open in October 2010, the nation's largest, completely refrigerated indoor produce center is scheduled to open in mid-January 2011.

The new Philadelphia Wholesale Produce Market opening was slowed by the late arrival of needed equipment and

other construction needs. Virtually the entire infrastructure surrounding the new facility located on Essington Avenue across from the City's "Airport Auto Mall" complex is complete. Real estate developer J. Brian O'Neill and the O'Neill Properties Group have worked with the Philadelphia Regional Port Authority (PRPA) to bring the multi-year project to completion. Environmental Standards acted as the environmental consultant for the O'Neill Properties Group Limited Partnership during the redevelopment.

The new Market will be home to the largest indoor freezer in the world, serving hundreds of regional produce vendors, and will retain the famous produce operation. Just how big is the facility? To provide some perspective, it has been reported that if the facility were turned on its side and stood straight up, it would be taller than the Empire State Building.

The Market is also a job producer. Project Manager Joe Kelly of O'Neill reports that the operation is expected to employ more than 1,500 food handling professionals who are currently employed at the old Distribution Center and is expected to add more jobs as well.

The complete project cost is projected to be approximately \$218.5 million. Overseeing the entire project was PRPA, which facilitated the construction by purchasing 63 acres for the 667,000-square-foot facility. It is nearly twice the size of the current and soon to be replaced Distribution Center.

A project description describes that it is a 100% fully refrigerated facility designed to prevent the cold chain from breaking from truck transport to loading docks to cold storage. Making this possible are steel, concrete, and 5-inch-thick insulated panels. The new facility will also feature 228 enclosed and fully refrigerated 50-foot-wide dock areas with 40-foot ceilings. A skylight running the length and width of the facility provides natural lighting.

Importantly, a central walking concourse will be open to the public. An additional 18,000-square-foot auxiliary building for pallets and food will also be opened at the same time. Thirty-two vendors will be relocated into the 68 units, each of which is 30-foot-wide and 140-foot long.

PRPA will be the landlord of the new Market, which is PRPA's first project of this scale outside the port district. PRPA, an independent agency of the Commonwealth of Pennsylvania, worked with other agencies of the Commonwealth, the City of Philadelphia, various financial firms, and the city's produce-industry interests to bring about the financing, construction, and leasing agreements for the new facility. ■



View of the market's 1300 foot-long central concourse.

Lighting Retrofit With Client Product

In April 2010, Environmental Standards replaced its 16-year old magnetic-ballast fluorescent lighting system using T12 bulbs with far more efficient T8 fluorescent systems using electronic ballasts. The goal of the retrofit was to reduce electrical usage while at the same time improving the lighting environment for our employees and guests.

With financial assistance provided by a grant from the Commonwealth of Pennsylvania, all fluorescent fixtures in the Valley Forge, Pennsylvania, headquarters building were replaced. Addition-

ally, sodium vapor lights in the lobby and other incandescent fixtures were replaced throughout the building.

We replaced our existing fluorescent lights with a client's product (GE F32T8 lamps) that was compatible with the replacement GE anti-arc ballasts. The light and ballasts work together as a watt miser and, therefore, use approximately 28 watts per lamp - a substantial electrical savings from the older system.

What was the outcome? The new building lights are very bright and create a

favorable work environment. Preliminarily, it appears that the firm will be saving approximately ten percent on our entire electrical bill in Valley Forge. Even with an unusually hot summer and the addition of more than a dozen new employees, electrical use went down. The savings, of course, result in yet another way we continuously try to minimize cost increases for our services.

So pleased is management with the outcome, that a similar retrofit is now underway in the Charlottesville, Virginia, office. ■



TVA employees and contractors, including Environmental Standards, celebrated the end of Time-Critical Ash Shipments from the TVA Kingston Fossil Plant Ash Recovery on November 9, 2010.

Principal News

Technical Director of Chemistry/Principal Rock J. Vitale, CEAC, CPC, is participating in a Texas-based study of practical quantitation limits (PQLs). This important study, which is sponsored by the Texas Commission on Environmental Quality (TCEQ), includes approximately 33 local, regional, and national laboratories. ■

Circle of Excellence

Environmental Standards was named to PSMJ's Circle of Excellence list of top performing firms. PSMJ's Circle of Excellence represents the top 20% of firms participating in PSMJ's Financial Performance Survey that achieve the best overall business performance in the industry. This distinction is awarded based upon a combination of 11 performance benchmarks that measure business operations in terms of profitability, growth, cash flow, overhead control, business development, project performance, and employee satisfaction. PSMJ, headquartered in Newton, Massachusetts, provides educational information and consulting services to the Architectural, Engineering, and Environmental industries. ■

US EPA Proposed Coal Ash Regulation Update

The United States Environmental Protection Agency (US EPA) proposed regulation of the handling and disposal of Coal Combustion Residuals (CCRs), otherwise known as coal ash. The potential risks associated with the safe disposal and management of CCRs under the Resource Conservation and Recovery Act (RCRA) are at issue. CCRs, currently considered exempt wastes under RCRA, are the byproducts from the combustion of coal at coal-fired power utility plants and are commonly stored in surface impoundments and landfills.

The US EPA is considering two options:

- Maintain the current designation of coal ash as solid waste under Subtitle D.
- Regulate coal ash, under Subtitle C, as "special waste" intended for disposal that is subject to hazardous waste management.

By classifying coal ash as hazardous waste, the Agency would maintain the authority to federally enforce all appropriate enforcement requirements and to conduct inspections. Many opponents of this proposed option point out that a hazardous waste ruling would hinder coal ash recycling efforts, thereby devastating the beneficial reuse programs (*i.e.*, recycling efforts) already in place (supported



About 50 people gathered at Roane State Community College in Harriman, Tennessee, to discuss proposed new rules on coal fly ash. (Photo by Adam Brimer/News Sentinel.)

by the US EPA). Private-citizen and environmental watch groups support the hazardous designation and contend that human health concerns and structural integrity issues associated with aging coal ash impoundments and landfills across the country must be addressed. Both proposals are drawing support and criticism.

The US EPA has held public hearings on the Proposed Coal Ash Regulations in several cities across the US and solicited public comments until the November 19, 2010, deadline. For more information about the proposed rule and the fundamental differences between the two proposed options, visit www.epa.gov/wastes/nonhaz/industrial/special/fossil/ccr-rule/index.htm and look for additional information in future issues of *The Standard*. ■

2011 Conferences

The NELAC Institute Forum on Laboratory Accreditation, January 31 - February 3, 2011, Savannah, GA. Representatives from Environmental Standards will attend.

American Coal Ash Association (ACAA) Winter Meeting, February 1 - 2, 2011, Las Vegas, NV. Representatives from Environmental Standards will attend.

Battelle Sixth International Conference on Remediation of Contaminated Sediments, February 7 - 10, 2011, New Orleans, LA. Senior Technical Chemist David I. Thal will present "Guidance for GC/MS Analysis in Support of Oil Spill Forensics."

Brownfields 2011, April 3 - 5, 2011, Philadelphia, PA. Representatives from Environmental Standards will attend. ■



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Wishing you happiness this holiday
season and throughout the coming year.

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