Thank an Advertising JOURNAL Environmental Management

Heal th and Safety Professional :

WE YOU UPDATED YOUR SUBSCRIPTION INFO IN THE PAST YEAR? SIGNUP OR **RENEW FOR FREE ONLINE AT** WWW.EHSHOMEPAGE.COM OR CALL 480-422-4430

Is you like the Journal

AND ITS ENVIRONMENTAL APPLICATIONS AND IMPLICATIONS AND IMPLICATIONS KIRIL HRISTOVSKI, Ph.D. pg 6

Dec / Jan 2008/9 Vol 6 No. 6



Tools of the trade

We've built our reputation on a foundation of strong professional capabilities, honed project coordination and communication skills, and extensive statewide experience.

Our environmental services are a key part of that foundation. They include:

- · Groundwater monitoring and restoration
- Technical oversight for remedial actions
- Fuels/PCBs/VOCs

investigation/remediation

- · Contaminant transport modeling
- · Site assessments and property transfers
- · Regulatory compliance/permitting

in Phoenix:

6155 E. Indian School Rd., Suite 200, Scottsdale, Arizona 85251 (480) 659-7131, (480) 659-7143 fax

In Tucson:

221 N. Court Ave., Suite 101, Tucson, Arizona 85701 (520) 622-3222, (520) 622-4040 fax

www.clearcreekassociates.com



7 Terminals throughout the Western states

Hazardous/Non-Hazardous Transportation Environmental Remediation Services Waste Management Emergency Response Services - 24 Hrs



3045 South 51st Avenue, Phoenix, AZ 85043 602-278-6233 800-833-7602 Fax: 602-278-2884 www.mpenviro.com

CLEAR CREEK ASSOCIATES Practical Solutions in Groundwater Science

Offering comprehensive, hydrogeologic services in five integrated areas:

Groundwater Development Groundwater Modeling Hydrogeologic Investigations Environmental Services Mining Support

Phone: 520-745-4523 Fax: 520-790-9926

P.O. Box 19149 Tucson, AZ 85731-9149

Locally owned and operated for over 20 years We pay top \$\$ for used oil Fleet of trucks, including vacuum tanker service Transformer oil & mineral oil recycling service Spent antifreeze and oil filter recycling service Wastewater recycling service Tank cleaning service 24-hour emergency response Multi-state service Fully insured

Arizona Waste Oil Service Inc.



EVOLVING ISSUES IN A CHANGING POLITICAL CLIMATE Roundup 2009

2-Day Conference

February 17-18, 2009



Chaparrel Suites Resort 5001 N. Scottsdale Road

Visit www.epaz.org or www.thunderbirdchmm.org for current conference registration, sponsorship, exhibition and accommodations.











Keynotes

Jeff Flake, US Congress, AZ 6th District (INVITED) Vernon Masayesza, Director, Black Mesa Trust Stephen A. Owens, Director, (INVITED) AZ Department of Environmental Quality

Lou Trammell, Director, Division of Emergency Management Martin Spong, Manager of Construction, Valley Metro Rail

Contacts

Conference Chairperson, Brad Cross, 480-905-9311 or brad.cross@lfr.com

Conference Co-Chair, Michael Ford, 602.364.7417 or mcford@bryancave.com

Sponsorship Coordinator, Laura Malone, 602.232.4037 or laura.malone@goodrich.com

Exhibit Coordinator, Nancy Nesky 480.706.6488 x3388 or nnesky@itsi.com

Conference Costs

Full Conference Registration – Members \$140 Non-Members \$160, One Day Registration -Members \$75 / Non-Members \$85, Special Course Offering: February 18th, OSHA 8-Hour Hazwoper & RCRA Update, \$140

Topics

ADEQ Division Updates, Air Quality, Stormwater, Solid Waste Rule, Global Warming, Sustainable Water Treatment Options, Biodiesel, Solar Initiatives, Climate Change Regulation, **Emergency Preparedness, Criminal &** Terrorist Act Prevention, Workplace Violence, Tier II-EPCRA Updates, Tier II Chemical Inventory Reporting, Spill Reporting, Vapor Intrusion, Soil Remediation and more

From the Editor



have been hearing the term nanotechnology a lot lately — Lit is fast becoming one of the newest hot topics. And with its vast potential for new and creative advancements in medicine, energy, and in environmental fields it is certain to play a major role in our future. For an update on the latest developments in this new technology, Kirl Hristovski, Assistant Research Professor with

the Department of Civil, Environmental and Sustainable Engineering, at the Ira A. Fulton School of Engineering, Arizona State University, provides a fascinating in-depth primer on nanotechnology and its environmental applications and health and safety concerns (see page 6).

If you have not been to the Journal's website (www.ehshomepage.com) recently, you will find several new features and a new format that I hope you will enjoy and find useful. For example, although PDF copies of past issues have been posted to the site for several years now, columns and selected articles will now be posted in HTML format for easy searching and viewing. It will take several months before all past columns are formatted and uploaded, but you can begin viewing recently posted columns now. Another feature that may be useful to you is the listing of Journal advertiser logos and links in a column along the right side of the the site. The links take you to an advertiser page with contact information as well as links directly to the advertisers' websites. Be sure to tell our advertisers you saw them in the Journal!

Most of you will be receiving this issue shortly before Christmas, so have a very Merry Christmas, a Happy New Year's, and a great 2009!

Sincerely,

Jim Thrush, M.S. Environmental Management Publisher & Editor

LEGAL DISCLAIMER Information presented in the Journal of Env. Mgmt. AZ originates from a variety of sources presumed to be accurate and complete. However, due to the rapidly changing nature of regulations and the kaw and our reliance on information provided by various sources, we make no warranity or guarantee concerning the accuracy or reliability of the content of the Journal. Readers are encouraged to contact authors, agencies, advertises, and companies directly for verification and/or clarification. Material is for informational purposes only, and should not be considered as legal or professional advice. Consult your own legal consul or environmental consultants with questions regarding your safety or environmental compliance matters.

WARNING: Serious legal, environmental, and/or safety consequences can result from non-compliance with environmental and safety regulations and standard safety, environmental, and professional practices.

Journal of Environmental Management Arizona Journal of Environmental Management Arizona EDITORIAL: Publisher & Editor: James Thrush, M.S. Env. Management jimthrush@cox.net or call 480-422-4430 x42 COLUMNISTS: Regulatory Developments: Michael C. Ford, Bryan Cave LLP; Sustainable Development. Nicholas R. Hild, PhD., ASU; It's All About Chemistry: Larry Olson, PhD., ASU: Prospecting: Joe C. Holmes, ATC. SUBSCRIPTIONS: Subscribe at ethshomepage.com or call 480-422-4430 x42. RATES: FREE to Qualified EHS Professionals. Others, call 480-422-4430. MAILING ADDRESS: Journal of Env. Management Arizona, 3145 E. Chandler Blvd, Suite 110-641 Phoenix, AZ 85048. Phone & Fax: 480-422-4430 ADVERTISING Call 480-422-4430 x42. The Journal is published 6 times a year. Convertide (© 2008 hv the Journal of Environmental Management Arizona, All sidh treserad Copyright © 2008 by the Journal of Environmental Management Arizona. All rights reserved.

4 Journal of Environmental Management Arizona

2009 Tucson Gatekeeper Seminar For Environmental, Health & Safety Professionals!

January 28, 2009 Manning House 450 W. Paseo Redondo, Tucson, Arizona

Selected Seminar Topics

- Online Registration and Filing of Tier II Reports
- Facility Emergency Response Plans Online
- Web-Based Risk Management Plans
- EPCRA Amendments
- EPA Enforcement Activities
- Fire Code: Biodiesel Home Production and Storage
- Emergency Response Communications Across Borders





PSC provides nationwide industrial services, environmental services, transportation and container services, delivered by thousands of skilled and committed professionals throughout North America.

PSC is the single source for industrial cleaning services:

- Hazardous Waste Disposal
- Labpack
- Household Hazardous Waste Services
- Soil Excavation/Remediation/ Decontamination
- Vacuum Tankers
- Roll-off and Vacuum Bins
- Super Suckers and Jet Rodders

What does PSC stand for?

People, Service and Commitment. As the industry leader, we don't just promise these qualities. We live them every day.

PEOPLE, PERFORMANCE, PRIDE, PROMISE THIS IS PSC NOW

PSC 2003 W. McDowell Phoenix, AZ 85009 602.252.1186

JOURNAL OF Environmental Management

December / January 2008/9

Volume 6 Number 6

ARIZONA

FEATURES AND ARTICLES

- 6 MUCH ADO ABOUT SMALL MATERIALS NANOTECHNOLOGY AND ITS ENVIRONMENTAL APPLICATIONS AND IMPLICATIONS. *KIRIL HRISTOVSKI, PH.D.*
- 8 APACHE POWDER SUPERFUND SITE WETLANDS

COLUMNS

16 SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

> "... IT TAKES A VILLAGE ... " PART II OF II NICHOLAS R. HILD, PHD.

- 15 IT'S ALL ABOUT CHEMISTRY ALGAE - IS IS THE ANSWER? LARRY OLSON, PHD.
- 22 PROSPECTING: FOR ENV. BUSINESS CLIENT RELATION MANAGEMENT SYSTEMS JOE C. HOLMES, ATC ASSOCIATES

DEPARTMENTS

- 4 FROM THE EDITOR
- 18 NEWS BRIEFS
- 14 ADVERTISERS INDEX
- 12 Associations Pages

Help Wanted?

Looking for EH&S Hel p? ! Advertise in the Journal 480-422-4430 x42



Nanotechnology and Its Environmental Applications and Implications Page 6



Apache Powder Superfund Site Wetlands Page 23

Environmental Compliance Solutions, Inc.

Create your Emergency Response Plan on-line, in a user-friendly, secure SSL, web-based, environment. Be in compliance with local, state & federal emergency plan reporting requirements, while providing your EMERGENCY RESPONDERS with up-to-date, vital information about your facility. Visit our website at:



www.encompsol.com Or, call us toll-free at 877.655.6952

"PROVIDING VITAL EMERGENCY RESPONSE INFORMATION IN THE 21st CENTURY"

RECOVERING TODAY'S RESOURCES FOR A CLEANER TOMORROW

We specialize in the treatment of non-hazardous liquid waste through physical separation, chemical treatment, biological treatment and sludge de-watering technologies.

- Waste disposal solution that is both economical and environmentally sound.
- On-site laboratory for profiling waste / sample technicians.
- After treatment, reclaimed water is returned to Arizona.
 Manage liquid waste for thousands of clients including
- some of Arizona's largest companies.
 Ask us about a cost effective alternative to your
- current waste disposal method.



COVER IMAGE: NANORUST PARTICLES. PHOTO COURTESY OF CBEN/RICE UNIVERSITY. SEE ARTICLE PAGE 6.

Conte<mark>nt</mark>s

Much Ado About Smal I Material s

Nanotechnol ogy and its Environmental Appl ications and Impl ications

by Kiril Hristovski, Ph.D.

What is nanotechnol ogy?

n the last twenty years, since the synthesis of the first engineered nanomaterials (the Bucky balls), nanotechnology L has been rapidly increasing its presence in our everyday lives. Nanomaterials, besides being used in new cutting-edge technologies, are also being introduced at an exponential rate in commercial products available to consumers. While in 2006, there were more than 300 commercial products available on the market claiming to have enhanced properties due to incorporated nanomaterials, this number has more than doubled in 2008¹. An inventory of commercially available nanomaterials prepared by The Project on Emerging Nanotechnologies states that there were more than 850 commercially available products containing nanomaterials in August 2008. In brief, nanotechnology is becoming a part of our lives and our vocabulary. But, what is nanotechnology and what is the big noise about these small materials?

A commonly cited definition defines nanotechnology as "understanding and control of matter at dimensions roughly 1 nm to 100 where unique phenomena enable novel applicaitons"². To obtain a better understanding of the physical meaning of "nano-sizes", it is good to illustrate the size differences by comparing the size of nanomaterials with actual physical representations to which people can relate. A tiny raindrop with an approximate size of 1 mm is 10 thousand to a 1 million times larger than a nanoparticle. A bacterium, which generally speaking has a size of approximately 1 μ m, is 10 to 1 thousand times larger than a nanoparticle. Viruses, which can generally range between 30 to 300 nm, can also be larger than many nanoparticles. In essence, nanotechnology deals with materials that are larger than single atoms and simple molecules, but smaller (or similar in size) than viruses.

So what is so unique about these materials, which makes them the current darlings of the industry and research community? Materials with these sizes exhibit novel physical and chemical properties which are not exhibited by bulk materials. Nanomaterials exhibit these novel properties because of couple of major reasons. A general rule of thumb is that quantum mechanics controls matter at distance ranges that are smaller than 1 nm, while the classical physics controls mater at distance ranges that are greater than 100 nm. Having sizes between 1 and 100 nm, nanomaterials can be "fine-tuned" to utilize the benefits of "both worlds". Additionally, the specific surface area of a nanomaterial, which is proportional to the fraction of surface exposed molecules, increases exponentially with decrease of its diameter³. While a nanoparticle with a size of 200 nm may have only 2% of its molecules (or atoms) exposed on its surface (i.e. located on the surface of the particle), this fraction may be 60% for a nanoparticle with a size of 2 nm⁴. This increase in specific surface area, i.e. surface exposed molecules, results in increased reactivity of nanomaterials, which consequently leads to improved catalytic, adsorptive or other properties such as selfassembly. Additionally, the small size of nanomaterials provides them with another important attribute. Nanomaterials can often be combined with other "base" materials to create hybrid materials, thus allowing for new applications or technology modifications/ minimizations. These hybrid materials may exhibit completely novel properties, synergistically enhance the property of the "base" material, or combine the properties of the nanomaterial and the "base" material.

Environmental applications and implications of nanomaterials

Considering these novel attributes of nanomaterials, the question of nanotechnology's impacts upon our present, future and environment is an important one that must not be ignored. Introduction and implementation of nanotechnology in present day society and environment can be viewed from three different perspectives: (1) the beneficial effects of nanotechnology; (2) the adverse effects of nanotechnology; and (3) the unknowns of nanotechnology.

Beneficial effects of nanotechnol ogy

Understanding beneficial effects of nanotechnology, the federal government has stressed the important role of nanotechnology in the future by allocating significant funding for nanotechnology research and development. According to a report from the National Science and Technology Council, total U.S. federal spending on nanotechnology has exceeded \$5 billion since the creation of the National Nanotechnology Initiative in 2001. In 2006 alone, the federal administration requested \$228 million for research and development of nanomaterials; and \$244 million for nanomaterial devices and systems research and development.⁵



Removing arsenic from drinking water with nanorust particles

According to the Rice University Office of Media Relations, the discovery of unexpected magnetic interactions between nanoparticles of rust is leading to a revolutionary, low-cost technology for cleaning arsenic from drinking water. Researchers from Rice University's Center for Biological and Environmental Nanotechnology (CBEN) described the technique in the November 10, 2006 issue of Science.

courtesy of CBEN/Rice University.

 Photo 1 (COVER):
 Nanorust particles

 Photo 2 (ABOVE):
 Arsenic in water binds to nanorust particles

 Photo 3 (AT LEFT):
 Arsenic-laden rust particles are drawn out by magnets, leaving clean drinking water

 The images on this page and on the cover page were provided

Contknued on page 8



Providing the Finest in Environmental Service

 24 hour emergency spill response
 Soil remediation
 Storage tank cleaning and removal
 Vapor extraction system installation
 Asbestos abatement
 Waste management
 Bulk chemical transfer Industrial decontamination
 Lab packing

Offices in Phoenix, Denver, Atlanta, Portland, Colorado Springs 480-632-2119 800-930-0011 BELFOR

More than remediation.

Asbestos, Lead and Mold Assessments Property Condition Assessments LEED[™] Services Industrial Hygiene Services Geotechnical Engineering Construction Materials Testing

PHONE: 480-894-2056



www.atcassociates.com

Nanotechnol ogy

Hristovski Continued From Pg 7

In general, the beneficial effects of nanotechnology upon our society can be viewed through the prism of sustainability. Implementation of nanotechnology in the fields of energy, environment, medicine, and information technology could significantly contribute to improved quality of life, protection of the environment, and sustainable practices.

Nanotechnol ogy and Energy

Nanotechnology could provide for minimization of loses during energy transport by improving the properties of thermal insulators and power conducting materials. Additionally, it could help develop or improve the existing technologies for production of clean energy. By developing novel nanomaterial based catalyst or proton transport membranes, the efficiency of fuel cells could be enhanced or they can be modified to use natural gas or other fuels which are alternative to hydrogen and safer to transport and store. In contrast, hydrogen use can be expanded by developing nanotechnologies capable of supporting efficient and safer transport and storage of hydrogen. Solar energy could be more efficiently converted into electricity by using nanotechnology to collect a broader range of wavelengths in the solar spectrum. This, in turn, could lead to manufacturing of smaller and cheaper solar cells that are affordable to wide range of consumers. As a consequence of this decentralized energy production system, the need for centralized power plants could be reduced or even eliminated.

Nanotechnol ogy and Environment

Nanotechnology offers a bright future for solving existing environmental problems and preventing future degradation of the environment. Nanotechnology can contribute to pollution prevention by improving the manufacturing processes to use smaller quantities of raw materials, water and other resources, and generate less toxic, renewable, or environmentally safe wastes. A great emphasis has been placed on development of sensors and detection devices that incorporate nanotechnology. These would exhibit higher sensitivity and specificity to a plethora of biological and chemical species when compared to existing sensors. Nanostructured oxidants, reductants, and nutrients could help promote contaminant degradation via biological or chemical processes. Nanomaterials could be used in fixed bed or slurry reactors allowing for end-ofpipe treatment of contaminated soil, water, air, or wastes. These could also be used as photocatalysts that produce hydroxyl radicals to oxidize organic contaminants. The high surface area of nanomaterials could allow developing adsorbents with improved adsorption capacity and mass transport properties, which could be used in specific point-of-use applications. Nanomaterials may also help with degradation of organic contaminants that could only be treated using in-situ technologies. Introduction of nanomaterials into contaminated aquifers could facilitate remediation by natural attenuation.

Nanotechnol ogy and Medicine

Implementation of nanotechnology in medicine could allow for better diagnostics, illness characterization and improved healing

practices. Nanotechnology could help develop new imaging equipment and practices that allow for improved resolution or identification of cells. This could lead to early detection of illnesses as a result of improved tissue details. Drug delivery is one of the major research drives for medical applications of nanotechnology. Nanotechnology could allow precise drug delivery. By attaching specific proteins or nucleic acid fragments to a nanoparticle that encapsulates a specific medicine, a nanoparticle can be "programmed" to deliver an exact amount of drugs only to diseased cells that are targeted by the attached proteins or nucleic acids fragments. This would dramatically reduce manifestation of side-effects, and prevent the damaging effect of the medicine to healthy cells.

Nanotechnol ogy and Information Technol ogy

Nanoscale electronics, with nano-switches and nano-circuits that are several atoms in size could open a door for development of new generation of computers that are smaller, faster, cheaper, and use very little energy. Nanomaterials could help to develop new display devices that are thinner, more durable and flexible than today's cutting edge screens. Harvesting the benefits of the quantum mechanics, nanotechnology could pave the way for development of information storage devices with data storage capacities several order of magnitude greater than today's hard drives or other optical data storage devices. Although in the distant future, it is conceivable that the benefits of nanotechnology would be used to develop new humancomputer interactions brining the human existence to a new level.

Stages of Nanotechnol ogy Devel opment

Although they cannot be explicitly differentiated, four separate nanomaterial generations can be identified on the temporal scale of nanotechnology development at the present time.⁶ Each generation is characterized by a higher level of technological complexity. The nanomaterials of the first generation, which started at the beginning of this decade, encompass, so called, passive nanostructures. On the technological complexity scale, these are the simplest nanomaterials such as particles, polymers, catalysts, composites, etc. The second generation, which is now active, belongs to the, so called, active nanostructures. These encompass more complex nanomaterials such as transistors, amplifiers, targeted drugs and chemicals, sensors, fuel and solar cells, high performance nanocomposites, etc. The third generation of nanomaterials, which is projected to "step on the scene" at the end of this decade, encompasses the 3-D nanosystems and systems of nanosystems. This generation of nanomaterials will include novel nanoscale architectures and networks, self-assembling systems, nanoengines, biometric materials, etc. The incipient nanomaterials of this generation are being already reported by researchers at Arizona State University.⁷ The fourth generation of nanomaterials, which is to be introduced in the second half of the next decade, will focus on ever smaller and more complex molecular nanosystems. It is expected, that this generation of

Continued on page 10

Hazard Prevention Institute (HPI) Safety, Environmental & Emergency Management Solutions

Training & Consulting Services

Miguel A. Rodriguez President

Office: (520) 887-0355 Cell: (520) 440-1352 Fax: (520) 887-0180; Toll Free: (800) 915-2492 E-mail: miguel@hazardprevention.com Website: www.hazardprevention.com

enviro**sure** Phone 480-784-4621 smart, sustainable solutions EPA SPCC Plans & Training HazMat Inventories

- HazWaste Management & Disposal
- **OSHA Safety Programs & Training**
- **DEQ Storm Water Plans & Training**

1979 E. Broadway Road, Suite 2 Fax 480-784-2207

- Sustainable Development "Go Green"
- Site Assessment & Remediation

Clean Construction

Tempe, Arizona 85282 www.envirosure.com



N. Weiss Associates, Inc.

Environmental Compliance Services

Experience Counts

Contact: Norm Weiss @ (602) 870-5504 Web Site: www.nweissassoc.com



Nanotechnol ogy

Hristovski Continued From Pg 9

nanomaterials will introduce in our society molecular or atomic devices with new and emerging functions. But what is next? What will the fifth generation of nanomaterials bring?

Adverse effects of nanotechnol ogy

The novel properties, which make nanomaterials "the next greatest thing" in development of new beneficial technologies, can also cause them to have an adverse effect upon the human health and ecosystems if they are uncontrollably released into the environment. Learning from previous negative experiences (ozone depleting chemicals, DDT, etc.), governments, health, and environmental agencies around the world consider investigations about the adverse effects of nanomaterials to be an imperative. In the US, the federal government allocated \$39 million for environmental, health and safety research for 2006 alone, while this number increased to almost \$59 million for 2008.^{2,5}

Nanomaterials can be considered a separate category of environmental contaminants because they exhibit different behaviors than "conventional" chemical pollutants even if they are made of the same chemicals as their chemical pollutant counterparts. Unlike chemicals which can dissolve in solvents (e.g. water or organic), nanomaterials form suspensions that could be stable or unstable depending on their properties and properties of the solvents. The different properties of nanomaterials could dictate their mechanisms of fate and transport in the environment. These mechanisms of "conventional" chemicals. As such, the existing models that predict behavior of conventional chemical contaminants may not be able to predict the behavior nanomaterials in the environment.

Their small size makes nanomaterials the ideal culprits capable of penetrating biological barriers (e.g. epithelium) found in the bodies of living organisms, even in cases where these barriers are impermeable to "conventional" chemicals. Once nanomaterials penetrate a biological barrier and enter the body, their large surface area and ability to generate reactive oxygen species can cause inflammation and fibrosis on an organism level, while causing cytotoxicity and death on cellular level.⁸ Additionally, systemic toxicity and/or accumulation in specific organs such as liver and kidneys can cause lesions and/or failure of the organ.⁹

Ecotoxicological reports show that nanomaterials may be toxic to both unicellular and multicellular aquatic organisms.⁸ Nanosilver, the most widely used nanomaterial in commercial products, being a bactericide, damages microbial cells resulting in their death.¹⁰ Titanium dioxide, silicum dioxide, and zinc oxide, which are not toxic in bulk, have toxic effect on bacteria. Carbon nanotubes were found to be a respiratory toxicant in trout.¹¹ Some reports suggest that size and shape of these nanomaterials can play a significant role in determining their toxicity. Carbon and mineral nanofibers (e.g. asbestos) have been shown to cause respiratory problems, including fibrosis and cancer. The fiber length can be an important factor since longer nanofibers arer not easily cleared by the alveolar macrophages.⁹

Besides being small and exhibiting properties that are different from the known contaminants, many nanomaterials used in beneficial applications are comprised of materials that, by themselves, are toxic to living organisms. For example, quantum dots, a type of nanoparticles that are used in research, are often comprised of a central core that contains heavy metals such as cadmium. Additionally, their large surface area can make nanoparticles excellent adsorbers which exhibit high capacity for known contaminants. Many nanomaterials can adsorb contaminants from the environment, thus concentrating them on the surface. Once nanomaterials (with the already adsorbed/ concentrated contaminant) enter an organism, they can release the adsorbed contaminant exposing the organism to much higher contaminant concentrations than it would be exposed under ordinary conditions. This high concentration of toxic contaminant may be sufficient to cause acute toxic effect from which the organism may not recover. In many cases, nanomaterials and adsorbed contaminants can act synergistically, creating a much greater toxic effect than one created by both culprits separately.

The existing research shows that nanomaterials have a potential to cause serious health and environmental problems. From the available data, scientists can project the seriousness of this issue. This is good because the adverse effects of many wonder chemicals were not adequately addressed in the past, which generated environmental problems of great magnitude.

Unknowns of nanotechnol ogy

Although many things are known about the environmental implications of nanomaterials, the science has yet to answer a myriad of questions. These answers will, in turn, generate different perspectives and new questions. Today's science is trying to develop the instruments necessary to answer the key question: is nanotechnology safe? Before this question can be answered, answers to a number of essential questions have to be obtained to prevent another "ozone depleting" scenario. Therefore, scientific community must proceed with caution.

The fate and transport of nanomaterials in the environment is still not well understood in spite of the immense research that is currently being conducted. This prevents scientists from developing good models that can predict the behavior of nanomaterials in air, water, or soil. Data is needed to develop proper remediation and mitigation strategies in case of an accidental release of nanomaterials. Toxicity data is needed to understand how nanomaterials interact with the living organisms so risk assessment can be conducted and standards for exposure to nanomaterials and personal protective equipment can be developed. Considering the future development stages of nanomaterials, a vast number of interactions can exist between nanomaterials and living organisms in the environment.



Be seen. Support Arizona's environmental management community. Advertise in the Journal.

JOURNAL of Environmental Management 480-422-4430 x42 ARIZONA



Associations Pages

The Journal of Environmental Management Arizona invites environmental, health and/or safety organizations in Arizona to contribute news articles about their associations. Contact the editor at 480-422-4430 x42.

Arizona Environmental Strategic Al l iance

The Arizona Environmental Strategic Alliance is growing. I am pleased to announce the Alliance Advisory Council recently approved the application of our newest

www.azalliance.org member, Kitchell Corporation. Kitchell was accepted for Alliance

membership based on its demonstrated commitment to environmental leadership principles and characteristics that each Alliance member must meet. As part of its application, Kitchell highlighted several examples of continuing pursuit of environmental excellence including a construction waste management program and an education/mentoring program on dust control regulations they offer to industry peers. Kitchell employs approximately 1,200 employees and includes subsidiary companies such as Kitchell

Contractors, Inc. of Arizona and Kitchell Environmental, Inc. For more information about Arizona the **Environmental Strategic** Alliance, please contact Jim Thrush, President, at 480-422-7392.



Happy and Safe Holidays to you

and yours! The local Arizona

Chapter of SESHA is holding our

next Chapter Meeting on Wed.,

Jan. 28th from 2-5pm. We hope

SESHA AZ Chapter Semiconductor Environmental Safety & heal th

www.seshaonline.org

you can join us at ASU's University Club building located on the main campus at 425 East University Drive in Tempe. For a map, please go to http://uabf.asu.edu/uclub

Presentations will include "Environmental Auditing", Maximize Risk Management through Interactions with Outside Agencies", and "Investigation of an Actual Arc Flash Incident". Our National Board of Directors will be in attendance in case anyone has

questions for them about the SESHA organization.

Attendance is FREE so please RSVP by calling 602-

470-4408 or emailing me at cpomerenke@rohmhaas.com. Christine Pomerenke, Wishing you all the best in 2009!



www.SAEMS.org

SAEMS Year, the Executive Board would like to thank all of our dedicated members, volunteers. sponsors, speakers, and event attendees for helping

As we head into the New

President

make our organization a success. Coming up on January 28th is the SAEMS Annual Gatekeeper Seminar at the Manning House in downtown Tucson. Federal, state and local agencies will speak on hazardous materials and emergency preparedness and response including Tier Two reporting, facility emergency response plans, risk management planning, EPCRA enforcement and response coordination at the border. Our monthly luncheon will be held in conjunction to the seminar. More information and registration forms are available on the SAEMS website at www.saems.org.

Future Luncheon Speakers: Feb. 25: BJ Cordova, Tucson Clean and Beautiful. Mar. 25: Placido dos Santos, AZ Dept. of

Water Resources. Thank you for a great 2008 and we look forward to 2009!



The Grand Canyon Section

of A&WMA would like

extend a special thank-you to

Salt River Project for hosting

our October meeting at their

www.awma-gcs.com

Arizona Falls hydroelectric facility. All those that attended were able to enjoy the wonderful facility that SRP has created at this location and learn a little history in the process.

We would also like to thank Lawrence Odle, new Maricopa County Air Quality Director, for speaking at our December meeting. Lawrence was able to give us some insight into the challenges facing Maricopa County in the air quality area and how the Air Quality

Department will be tackling those issues.

Please check our website at www.awmagcs.com for additional information and upcoming meeting topics.



The Thunderbird Chapter is pleased to announce the results Thunderbird of the election for the 2009 Board of Directors. effective Jan. 1. 2009: President: Matt Jacobs, Belfor USA; VP/ President-elect: Mike Ford,

Kale Walch,

President

www.thunderbirdchmm.org

Bryan Cave, LLP; Secretary: Laure Preston, GAIC; Treasurer: Chuck Paulausky, CPSE; Director-at-Large: Courtney Perrier-Bear, ADOT; Director-at-Large: Jeff Page, City of Phoenix

Mark your calendars for the 2009 Gatekeeper Regulatory Roundup, and don't forget that membership in the Thunderbird Chapter will save you up to \$20.00 on the GRR registration. AND, Thunderbird members also attend the monthly ACHMM/EPAZ meetings at a discount!

The ACHMM/EPAZ monthly lunch meetings are held from 11:30 ~ 1:00 on the 2nd Thurdays of each month. Note that the meeting location has changed to the Pera Club in Tempe, so check your emails for the meeting notice. Meeting details: www.thunderbirdchmm.org or www.epaz.org. AND,



don't forget the Thunderbird Happy Hour on 1st Thursdays, 5:30 PM -?? Calendar Items: Jan - No T-Bird Happy Hour; Jan 8 -

Luncheon Meeting, New Solid Waste Rules; Feb 5 - T-Bird Happy Hour, Four Peaks, Tempe; Feb 17-

18, 2009 – Gatekeeper Regulatory Roundup at the Chaparral Suites; Mar 5 - T-Bird Happy Hour, Sugar Daddy's, Scotttsdale; Mar 12 - Luncheon Meeting, TBD; Apr 2 - T-Bird Chuck Paulausky, Happy Hour, Tilted Kilt, Tempe Board Member





It's difficult to believe we are nearing the end of yet another year. The EIA-AZ Chapter is anticipating 2009 to be a year of excitement for the

environmental industry. The Chapter looks forward to working with the Maricopa County Air Quality Division and the State Occupational Safety and Health Administration to bring an awareness to private, corporate, industrial, municipalities, property owners and managers for regulatory compliance issues related to asbestos. A series of educational seminars and other programs will be listed on our website.

Please visit our web site at http://www.eiaaz.org or call 602-437-3737 ext. 123 for information on all upcoming events sponsored by EIA-AZ.





www.azhydrosoc.org

The local chapters of the Arizona Hydrological Society have organized very interesting schedules for monthly chapter

meetings this Fall. The Phoenix Chapter hosted a dinner meeting Nov 18, and representatives from the Arizona Department of Water Resources (ADWR) made a presentation on the ADWR Ground Water Site Inventory web applications. On Dec. 9, Jolene Tallsalt Robertson, Navajo Nation, made a presentation on the water resource projects of the Navajo Nation The Tucson Chapter hosted a social hour on November 18, and Deborah Tosline, United States Bureau of Reclamation discussed the history and recent activities of the USBR in Southern Arizona. The Arizona Hydrological Society 2009 Symposium is

scheduled for Aug. 30 to Sept 2, 2009 and will be held at the Westin Kierland Resort and Spa in Scottsdale, Arizona. The symposium theme will be "Managing Hydrologic Extremes."





www.azchamber.com

The Arizona Chamber of Commerce and Industry's Environment Committee hosted Lawrence Odle. the newly appointed director of Maricopa County's Air Quality Department, at its November **Environment Committee Breakfast**

Meeting. Mr.. Odle briefed the group on his background and outlined the many air quality challenges facing Maricopa County including its most pressing matter of coming into attainment. The Arizona Chamber's Air Subcommittee will be working with Mr. Odle and his staff along with other stake holders to address areas of common concern and improve compliance. In addition to air issues, the Arizona Chamber's Environment Committee continues to focus, monitor and comment on greenhouse gas, waste and water issues

affecting industry through its and Water Waste Subcommittees and its Energy Committee respectively. For information on participating on any of these committees, please contact Jeff Homer at 480-441-6672.



IRONMEN, EPAZ www.EPAZ.org the

EPAZ In October, welcomed Grady Gammage Jr. from the Morrison Institute who presented a vision of the future potential urbanization of area from Tucson to Prescott

as described in the Institute's Arizona Megapolitan Report. Dr. Erik Fisher, Assistant Research Professor at ASU's Center for Nanotechnology in Society, gave a very informative presentation on "Nano-Safety in a World of Nano-Technology" at the Nov. meeting. Nano-technology is already a multi-billion dollar world-wide industry that is projected to grow exponentially over the next decade. Before that can happen, we need to better understand the environmental and health risks associated with this new branch of science. (Editor's note: See photos page 17.)

The scheduled speaker for the Decenber meeting is John Warner of Pima County who will describe their tripleplay of simultaneously obtaining ISO 9000, 14000 and 18000 certification. In January, Barton Day of Bryan Cave will discuss the implications of EPA's new waste/recycling rules.

Our new membership year began in November and

our major renovation of our website, complete with credit card processing capability, is expected to be in place by Dec 1st. Visit our web site for meeting and mixer details or contact me Mannie Carpenter, at (602) 393-4800.



President

Nanotechnol ogy

Hristovski Continued From Pg 10

Some scientists may consider that the unknowns are the reason why nanotechnology has not raised any flags. Another group of scientist may argue that the unknowns of nanotechnology are sufficient enough to raise the red flag. In both cases, one thing is certain: nanotechnology is not risk-free.

What will the future bring?

Besides the development of new beneficial nanomaterials and applications, the future research will have to provide answers about the real risks of nanotechnology. An article published in nature¹² emphasizes five grand challenges that have to be addressed in the next 15 years to minimize the risks and maximize the benefits of nanotechnology. The first challenge is to develop strategic programs that enable relevant risk-focused research. The second challenge is to develop instruments for assessment of exposure to engineered nanomaterials in air and water. The third challenge focuses on development and validation of methods to evaluate the toxicity of engineered nanomaterials, while the forth challenge focuses on development of models capable of predicting the potential impact of nanomaterials on environment and human health. The fifth and probably most complex challenge is to develop robust systems for evaluating the impacts of engineered nanomaterials over their entire life. Many of these challenges are already being tackled by researchers, and the results are promising. However, it is important to understand that every new technology brings risks, however small or great they may be. There is no life without risk. So we may have to revisit how we perceive risks or what our risk acceptance levels would be in the future ... and the future is not that far away.

About the author

Dr. Kiril Hristovski holds a Ph.D. in Civil and Environmental Engineering and an MS in Technology (Environmental) from Arizona State University. He is an Assistant Research Professor with the Department of Civil, Environmental and Sustainable Engineering, at the Ira. A. Fulton School of Engineering, Arizona State University. His research interests are: applications and implications of nanotechnology in water, emerging water contaminants, solid and hazardous waste, water and energy nexus, and emergency management. He can be reached at 1 480-727-1291 or via e-mail kiril.hristovski@asu.edu.

Literature Cited

- The project on emerging nanotechnologies. 2008. An inventory of nanotechnology-based consumer products currently on the market. Retrieved from on September 8, 2008 from: http:// www.nanotechproject.org/inventories/consumer/analysis_draft/
- The national nanotechnology initiative. 2007. Supplement to the President's FY 2008 Budget. National Nanotechnology Coordination 2 Office, Arlington, VA
- Oberdörster, G., Oberdörster, E., Oberdörster, J. 2005. 3 Nanotoxicology: An Emerging Discipline Evolving from Studies of Ultrafine Particle. Environmental Health Perspectives, 113 (7), 823 - 839



Sampling • Site Characterization • Data Validation Work Plans • Regulatory Guidance • Public Relations

« Celebrating 10 Years of Service »

- 4 Wigginton, N.S., Haus, K.L., Hochella, M.F. 2007. Aquatic environmental nanoparticles. Journal of Environmental Monitoring, 9(12), 1306 - 1316
- 5 The national nanotechnology initiative. 2005. Supplement to the President's FY 2006 Budget. National Nanotechnology Coordination Office, Arlington, VA.
- 6 Karn, B. 2006. A proactive Environmental Perspective on Nanotechnology: Presentation given at the Oregon Nanoscience and Microtechnologies Institute, Portland, OR, on March 6, 2006. Burdick J., Laocharoensuk, R., Wheat,[†] P. M., Posner, J. D., Wang,
- 7 J. 2008. Synthetic Nanomotors in Microchannel Networks: Directional Microchip Motion and Controlled Manipulation of Cargo. Journal of American Chemical Society, 130 (26), 8164-8165
- Nowack, B., Bucheli, T.D. 2007. Occurrence, behavior and effects of 8 nanoparticles in environment. Environmental Pollution, 150, 5-22.
- Stern S. T., McNeil, S.E. 2008. Review Nanotechnology safety 9
- concerns revisited. *Toxicological Sciences* 101(1), 4 21. Sondi I., Salopek-Sondi, B., 2004. Silver nanoparticles as antimicrobial agent: a case study on E-coli as a model for Gram-10 negative bacteria. Journal of Colloid and Interface Science, 275(1), 177-182.
- 11 Smith, C.J., Shaw, B.J., Handy, R.D., 2007. Toxicity of single walled carbon nanotubes to rainbow trout, (Oncorhynchus mykiss): respiratory toxicity, organ pathologies, and other physiological effects. *Aquatic Toxicology, 82*, 94 - 109.
- Maynard A., Aitken, R.J., Butz, T., Colvin, V., Donaldson, K., 12 Obersdorster, G., Philbert, M.A., Ryan, J., Seaton, A., Stone, V., Tinkle, S.S., Tran, L., Walker, N.J., Warheit., D. B. 2006. Safe handling of nanotechnology, *Nature*, 444(16), 267-269.

Advertiser Index

Aero Automatic Sprinkler Co.	9	Environmental Response, Inc.	20
Aplomado	14	Envirosure Solutions	9
ARCADIS	23	Gatekeeper Reg. Roundup 2009	3
Ashtead Technology Rentals	19	Grizzly Trackout Control	21
ATC Associates	8	Hazard Prevention Institute	9
AWOS	2	Kary Environmental Services, Inc.	17
Az State University EH&S Seminars	22	Liquid Environmental Solutions	5
Belfor Environmental	8	MP Environmental	2
Carter Affliates, Inc.	19	N. Weiss Associates, Inc.	9
Chemical Transportation, Inc.	18	PSC	4
Clean Harbors	22	SAEMS 2009 Gatekeeper Seminar	4
Clear Creek Associates	2	SAEMS 2009 Save the Date RCRA	17
Columbia Analytical Services	19	Terracon	9
Diversified Transportation Inc.	21	Turner Laboratories, Inc.	21
Env. Compliance Solutions, Inc.	5	Univar USA Inc.	24



Larry Olson, PhD.

It's All About Chemistry

Al gae -Is it the Answer?

In 1996, the U.S. Department of Energy, due to budget constraints, shut down an almost 20 year program designed to develop renewable transportation fuels from algae. Called the Aquatic Species Program, it was a relatively small part of a larger Biofuels program. In essence the DOE decided to focus on bioethanol rather than continue with algae research (see http://www1.eere.energy.gov/biomass/ pdfs/biodiesel_from_algae.pdf).

But interest in algal biofuels is reviving for several reasons. As we discussed in the last issue, it would take more than twice the current cropland in the U.S. to replace all the diesel fuel used in a year with biodiesel derived from soybeans. Waste oils and fats can be converted into biodiesel but still have the potential to replace only a small fraction of petroleum diesel.

However, microalgae can potentially yield as much as 100 times the oil per acre than any other crop. Microalgae consist of single cell photosynthetic organisms as distinguished from macroalgae (seaweed). Microalgae tend to store energy in the form of lipids rather than carbohydrates. In some species more than 60% of the mass is a lipid and under optimum conditions the mass may double several times a day. Most importantly, algae don't require arable land or potable water. The basic inputs are carbon dioxide, sunlight and water. Carbon dioxide utilization gives algae a two fold advantage since we are going to have to find new solutions to reduce greenhouse gas emissions anyway. A coal-fired power plant may emit flue gases containing up to 13% CO₂ so creating an algae farm next to a fossil fuel electric generating station provides a much more novel solution than simply trying to sequester carbon dioxide. The APS Redhawk plant in Arlington, Arizona has been testing this concept since 2006.

Arizona, of course, has lots of sunshine, but what about water? Fortunately, many algal species can grow in water that contains high levels of salts. So an algae farm does not have to compete with agriculture or cities for fresh water and does not need to displace food crops by using arable land. Thus, many of the limitations of other biofuels derived from crops are averted. It may even be possible to use the ocean as an algal farm, which could make a location like Hawaii a net energy supplier, rather than being totally dependent upon outside sources.

Algae can produce energy in three ways:

- biological or thermal gasification of algal biomass to produce methane
- fermentation of carbohydrate components to produce ethanol
- use of oils to produce biodiesel or aviation fuels.

Unfortunately, there are substantial technical problems remaining to make algal biofuels a competitive alternative to petroleum fuels. Estimates are that it would cost about \$8 per gallon for algal biodiesel today compared to about \$4 per gallon for soybean oil (http://www1.eere.energy.gov/biomass/pdfs/ algalbiofuels.pdf). Challenges include:

- identifying appropriate strains that can be grown in large quantities while controlling competing species and pathogens
- determining the best designs for economically cultivating algae on a massive scale
- improving harvesting and oil extraction technologies
- evaluating efficacy and potential impact of genetically modified algae
- determining impact on water, land use and carbon sequestration.

Many people are working diligently on this issue, including Milt Sommerfeld and Qiang Hu of Arizona State University, whose algae to fuel project was recently recognized by *Time* as one of the top 50 inventions of 2008 (http://asunews.asu.edu/20081107_algaetofuel).

Larry Olson, PhD., Associate Professor, Arizona State University Environmental Technology Management Program. Dr. Olson holds a Ph.D. in Chemistry from the University of Pennsylvania, and is an environmental chemist with interests in remediation technologies and international env. mgmt. He can be reached at 480-727-1499, or by email at Larry.Olson@asu.edu



Sustainabil ity and Sustainabl e Devel opment

Nicholas R. Hild, PhD.

"... it takes a village ... "eco-village," that is..."

Part II of II

An Eco-Village: It Ain't Your Father's Hippie Commune

In LA, an Eco-Village that began in 1993 operates in a two square block, mixed-use, low-to-moderate income, neighborhood three miles west of downtown within walking distance of bus lines and two subway stops. Within that two blocks, the 40 'village' residents have rehabilitated and retrofitted two buildings by making them more energy efficient and by reusing original building components in the remodel. They have a local food coop and are in the process of closing a street to develop an "Ecology Park" for the community—beyond that, however, little else has been done in the 15+ years since it began except to provide free eco-workshops and teach-ins for anyone wanting to know about eco-village living. There haven't been a lot of 'outsiders' who've joined their efforts, even though they have been able to stay the course with several of the original members still residing in the Eco-Village.

Another of the 379 eco-villages cited by Worldwatch Institute is in Cleveland, where an Eco-Village began in 1996 as a pioneering effort to demonstrate what principles of sustainable development could become a part of the eco-village lifestyle. Since it's founding, the Cleveland project has been revitalizing an urban neighborhood while incorporating the principles of green building design: solar panels, community gardening, green spaces, pedestrian oriented development and sustainable living workshops to educate the masses.

In Cleveland, however, as contrasted with most other ecovillages (including Arcosanti), there are no specific requirements for ecological living and their only rule is that residents have to participate in projects that attempt to benefit the 3,000 residents in the local area and not just the residents of the 'eco village' portion of the area.

That's proven to be both good and bad: it's good to 'educate' and get people to think about their personal eco-footprint, but it has proven to be difficult to convince members of the community at large to adopt an ecologically friendly lifestyle especially if elements of that life-style are more expensive than not. As Detroit's Shoreway Community Development Organization director Mandy Metcalf noted recently, "...people like living downtown or living in an energy efficient townhouse but they have not necessarily embraced every aspect of the eco-village vision."

It is clear that just because you build a "green" village, people won't necessarily just be knocking down the gates to participate.

That is why the LA Eco-Village Institute's Lois Arkin notes that most cooperatives are not "fully fledged and fully manifested" and are mostly "*aspiring* eco-villages." Lots of eco-village residents, she notes, "still own and drive automobiles..." — which begs the question, just how environmentally friendly do eco-village residents have to be to call their village an "*eco*" village?

If we are ever to realize our full potential to build evermore energy efficient and sustainable dwellings, communities, and supporting infrastructure, we need to start with a common vision— Arcosanti had great goals but no common plan that included venture capital resources or even government subsidies to make it a reality.

But, Solari's ideas have inspired a generation of architects who are beginning to share the vision that communities (i.e. villages) can become more sustainable if we start small and inculcate the principles of sustainable development in many different communities and in many different places. At its core, Arcosanti gave birth to the new millennium eco-village concept even though it was founded on 25 acres of remote desert land and not in a central city neighborhood. But Arcosanti's slow growth should be a warning to eco-village planners everywhere: sustainable growth requires resources—in this case, *real* resources—dollars and cents resources.

One example is the small community of Rock Port in northwest Missouri that recently christened a four-turbine wind farm which makes Rock Port the first U.S. city to get all of its electricity from wind power! They had the vision, to be sure, but they also recognized it would cost money to make it a reality—that is when the Wind Capital Group and John Deere Corporation stepped up and built the \$90 Million Loess Hills Wind farm on bluffs west of the town to generate five megawatts a day, which allows the 1,300 residents to "sell" and provide power back to the grid. They purposely built the 'farm' to produce more than double the power needed for the town, thereby being able to pay back the costs over future decades that will benefit the town's children's, children. And, in the construction process, more than 500 workers from 20 states came to this small 'village' boosting the local economy at the same time.

The lesson is, we can build eco-villages one green technology at a time, if we set out to involve a community in the planning. But, today, it's a capitalistic venture. Farmers in the Rock Port area saw the long term benefits of giving the town a little space to build wind turbines on their properties. In return, they reduced their energy consumption from fossil-fueled power plants and allowed the local utility to 'buy' power from the town that they didn't have to build power plants to provide.

Hippie communes of the '60's have come of age in the new millennium and we call them **eco-villages**—a concept that, with proper planning <u>and</u> funding, will help make the future better place for our children's, children's, children.

Nicholas R. Hild, PhD., Professor, Environmental Technology Management, Arizona State University College of Technology and Innovation, has extensive experience in Environmental Management in the southwestern U.S. Dr. Hild can be reached at 480-727-1309 and by email at DrNick@asu.edu.



EPAZ and ACHMM Luncheon Speaker: "Nano-Safety in a World of Nanoechnology"

he Environmental Professionals of Arizona (EPAZ) and the Thunderbird Chapter of ACHMM members and guests met November 13th at the SRP PERA Club in Tempe for the monthly members' luncheon and to hear a presentation by Erik Fisher, Assistant Research Professor, Center for Nanotechnology in Society, Arizona State University.



Erik Fisher ASU Center for Nanotechnology in Society



The 2009 Annual RCRA Seminar

Thursday, May 7, 2009

Marriott Tucson University Park Tucson, AZ

Mr. Fisher provided a very interesting background understanding of nanotechnology and discussed potential areas of EHS risk and existing guidelines for nanotechnology EHS protection. He co-edited the first volume of the Yearbook of Nanotechnology in Society.

For information on EPAZ and ACHMM see the Association Pages on page 12. *(Editor's note: See article on nanotechnology page 6).*



News Briefs

Vol untary Discl osure Saves Arizona Companies \$66,000

↔ US EPA Region 9 recently announced that four Arizona companies that voluntarily disclosed and corrected environmental violations have seen penalties waived by the U.S. Environmental Protection Agency. It's the result of an EPA policy that has been successful in getting companies to make good-faith efforts in self-policing their own environmental compliance.

The recent toxic release inventory self-disclosure cases had potential penalties ranging from \$6,400 to \$21,000 for violations that the agency determined caused no serious or actual harm to human health or the environment. Altogether, the four companies avoided \$66,000 in penalties.

"This is a win for communities and for the EPA," said Enrique Manzanilla, the EPA's Communities and Ecosystems Division

Phoenix Rillito El Paso Mexico

Chemical Transportation, Inc.

... more than the name implies

As the environmental industry has grown more complex and the regulatory climate more demanding, CT's scope of service has grown to include:

> Transportation Services Including Specialty Tankers, Roll Offs, & Vans

Waste Management Services Ranging from Large Quantity to CESQG Generators

On Site Services Industrial Pipeline Services Air Movers & Hydroblasting Safety & Compliance Services

CT: maintaining a solid reputation for quality service.

Phoenix, Arizona Toll Free: 888-444-7077 El Paso, Texas Toll Free: 888-999-2260 Rillito, Arizona Toll Free: 800-634-4828









director for the Pacific Southwest region. "Responsible businesses take it upon themselves to check for compliance and promptly disclose any environmental violations found. If they correct them quickly, these companies often see penalties reduced – in some cases to zero."

In the cases announced today, each company discovered the violations on its own and reported the violations to the EPA. Because the companies satisfied all conditions of the EPA's self-disclosure policies and there was no economic benefit gained, the EPA eliminated potential penalties.

The self-disclosure cases for Arizona facilities include:

Bay State Milling CompanyLocation: Tolleson, AZ, Potential Fine: \$19,300Brenntag Pacific Inc.Location: Chandler, AZ, Potential Fine: \$6,400Goodrich Evacuation SystemsLocation: Phoenix, AZ, Potential Fine: \$19,300Resolution Copper Mining, LLCLocation: Superior, AZ, Potential Fine: \$21,000

Under the EPA's audit policy, the agency may reduce penalties up to 100 percent for violations that are voluntarily discovered through

an audit or management system, promptly disclosed to the agency, quickly corrected, and satisfy other audit policy conditions. The policy excludes criminal acts, violations resulting in serious actual harm to public health or the environment, and repeat violations.

Under the EPA's small business compliance policy, the EPA will eliminate or significantly reduce penalties for businesses with fewer than 100 employees that voluntarily discover violations of environmental law and promptly disclose and correct them.

Federal law requires certain facilities using chemicals over specified amounts to file annual reports to the EPA and the state that estimate the amounts released to the environment, treated or recycled onsite or transferred off-site for waste management. The information is then compiled into a national database called the Toxics Release Inventory and made available to the public. More information about the audit policy can be found at: http://www.epa.gov/compliance/ incentives/auditing/auditpolicy.html.

Reddy Ice Corporation and Granite Capital , LLC Fined \$75,000 After Chemical Rel ease; Empl oyees From Neighboring El ectronics Facil ity Hospital ized

US EPA Region 9 announced recently that it has fined Reddy Ice Corporation and Granite Capital LLC \$75,000 for failing to follow emergency response regulations.

EPA inspectors discovered the violations following an accidental release of 14,000 pounds of anhydrous ammonia at 2030 Mountain View Road, Phoenix, AZ, Reddy Ice Corporation and Granite Capital, LLC's jointly owned ice manufacturing and cold storage facility. The facility is being fined for failing to immediately



report the accidental release to local authorities, failing to report the storage of an extremely hazardous substance, and failing to prepare, submit and implement a Risk Management Plan (RMP), violations of the Emergency Planning and Community Right-to-Know-Act and the Clean Air Act, respectively.

"Companies have a corporate and legal responsibility to comply with all laws and regulations governing the reporting of their chemical inventories and any releases they may have," said Keith Takata, the EPA's Superfund director for the Pacific Southwest region. "When companies fail to submit chemical inventory information and report chemical releases, the health of the public and local responders is put at risk, and we will take action against any company that fails to comply with these laws."

Employees from a neighboring electronics facility were hospitalized, streets were closed, and residences evacuated from their homes as a result of the release. The EPA worked closely with the Phoenix Fire Department to complete their investigation of the facility which also failed to comply with local regulations.

Under the Clean Air Act, facilities, like Reddy Ice Corporation and Granite Capital, LLC must prepare, submit and implement an RMP, including steps for normal and emergency shut-down operations for on-site gaseous materials over a certain threshold.

The Emergency Planning and Community Right-to-Know-Act requires all facilities using hazardous substances to report the amount of chemicals (or a chemical) on site, and notify state and local authorities immediately following an accidental release.

Exposure to high concentrations of ammonia causes immediate burning of the eyes, nose, throat and respiratory tract. In severe cases, it can result in blindness, lung damage, or death.

Draft Report on West Van Buren

Groundwater Cl eanup in Phoenix Avail abl e for Public Review and Comment

✤ Arizona Department of Environmental Quality (ADEQ) Director Steve Owens announced recently that a draft report on the largest state-monitored groundwater contamination site, located in west Phoenix, is available for public review and comment. The West Van Buren remedial investigation report examines contaminants in the groundwater of the plume, which stretches 8 miles in length from Seventh Avenue to 75 th Avenue and 1 ½ miles in width from Interstate 10 to Buckeye Road, and efforts undertaken to monitor the groundwater. The site is being managed by ADEQ's Water Quality Assurance Revolving Fund (WQARF), the state Superfund program. Since 2001, more than 50 monitoring wells have been funded by ADEQ to study the magnitude of groundwater contamination in the area and to



determine potential source areas. ADEQ currently monitors 118 groundwater wells for water quality and elevation information. "We have been making a lot of progress investigating and cleaning up the West Van Buren site,"

Director Owens said. "This is one of the oldest and largest state superfund sites in Arizona." ADEQ began work on the site in 1987 and the site was added to the WQARF registry list in April 1998. Among the contaminants of concern in the groundwater are tetrachloroethene (PCE) and trichloroethene (TCE), which are industrial solvents exposure to which can lead to serious health effects like damage to the nervous system and liver tumors.

For years, the West Van Buren area has been home to many

businesses involved in auto repair, dry cleaning, metal fabrication, plastics production and printing. Numerous facilities in the area have been investigated by ADEQ. About 118 million gallons of groundwater have been pumped treated. and removing 17.8 pounds of PCE and six pounds of TCE. Groundwater beneath the West Van Buren area is not used for drinking water purposes. The City Phoenix of municipal water system and other regulated systems serve residences and businesses drinking with water. Public comment on the Continued on page 20



News Briefs:

Continued From Pg 19

West Van Buren remedial investigation will be accepted through Dec. 30.

ADEQ Director Steve Owens announced recently that Gringo Pass Inc. will pay \$45,000 for leaking underground storage tank (UST) violations at the company's gas station along Highway 85 near Lukeville in Pima County dating back to 1998. Under the terms of a consent judgment between ADEQ and the company, in addition to the \$45,000 payment Gringo Pass Inc. will reimburse ADEQ for 10 percent of the total corrective action costs up to \$500,000 and all of the costs that

Arizona Contractor's Licenses B-General ROC 130187, ROC AE-101060, ROC C05-101110, EPA Haz, Materials Trans. Lic. # AZ0000303032

Environmental

Response, Inc.

24-Hour Emergency Response Soil Remediation Hazardous Waste Trans. & Disposal Facility Decontamination Lab Packing Excavation and Demolition Mold Remediation Lead Abatement Landfill Closure

Household Haz. Waste Collection Events Vapor Extraction System Installation Brownfields Remediation





exceed \$500,000. The agreement also allows ADEQ and its representatives to enter the facility for corrective actions and inspections.

The fuel that leaked from the UST's contaminated the soil in the area. ADEQ will conduct an investigation to determine whether the contamination also has reached the groundwater.

"This agreement ensures that Gringo Pass is being held accountable for the contamination at this site," Director Owens said. "We are committed to protecting Arizona's precious natural resources." Two of the leaking tanks held 7,500 gallons each and a third held 10,000 gallons. The tanks are no longer in use. The consent judgment is subject to approval by the Arizona Superior Court.

ADEQ CI eans Up Leaking Underground Storage Tanks in 11 School Districts

♣ ADEQ Director Steve Owens announced recently that the department has completed cleanups of leaking underground storage tanks (UST's) at sites in 11 school districts around the state. The cleanup was part of ADEQ's innovative School Assistance Initiative, which was launched a year ago to help schools across Arizona clean up contamination from UST's on school property and to prevent future leaks from the tanks. The program is a joint effort by ADEQ's Tank Programs Division and the department's Office of Children's Environmental Health.

"This unique partnership between ADEQ and schools and school districts throughout the state has been tremendously successful," Director Owens said. "This effort not only helped clean up the environment, it also protected our children from potential exposure to contamination. And it has saved schools a lot of money, since ADEQ cleaned up the sites and has given the schools technical assistance about how to maintain their UST's in the future."

ADEQ is using money from the State Assurance Fund (SAF), which is the state UST remediation fund, to clean up the contaminated soil and groundwater at the school facilities. ADEQ also has provided and will continue to provide technical assistance to schools and school districts to insure that UST's owned and operated by the schools and districts are properly maintained in accordance with the law to prevent future leakage.

Maricopa County Air Qual ity Viol ators

To Pay \$452,000 in Settl ements The Maricopa County Air Quality Department recently announced \$452,589.90 in air quality violation settlements made during October 2008. The three highest settlements for October are:

WDP Partners, LLC entered into an agreement effective October 27th for **\$45,476** to resolve 17 alleged air quality violations. Some of the alleged violations include: failure to prevent visible dust emissions from exceeding 20% opacity; failure to implement control measures before, after and while conducting dust generating operations; failure to



2202 W. Medtronic Way, Suite 108, Tempe, AZ 85281 Arizona 24 Hours (480) 967-2802 www.spraysystemseri.com



install, maintain and use a suitable trackout control device and failure to erect and maintain a project information sign at the main entrance. A complete list of the alleged violations is included in the table below. The alleged violations occurred at Rittenhouse Road & Ocotillo Road in Queen Creek. WDP Partners' office is located at 11411 N. Tatum Blvd. in Phoenix. The settlement amount was paid in full on October 27, 2008.

Southwest Rock Products, LLC entered into an agreement effective October 1st for **\$30,906** to resolve six alleged air quality violations. The alleged violations include: failure to obtain an air quality permit; failure to comply with the stabilization requirements where vehicles operate and failure to prevent fugitive dust emissions. The alleged violations occurred at 11500 W. Beardsley Road in Sun City and 7th Street & Happy Valley Road in Phoenix.

In addition, the company agreed to perform a Supplemental Environmental Project [SEP] in partial fulfillment of the requirements of their agreement. The environmentally beneficial project consists of submitting payment of \$7,790.20 for the production of 5000 copies of the "Tailgate Talks" dust compliance DVD, copyright 2006. Southwest Rock Products' office is located at 745 N. Gilbert Road #124-304 in Gilbert. The settlement is to be paid in two installments with the total amount due on November 21, 2008.

Hawkeye Construction Inc. entered into an agreement effective October 8th for \$19,145 to resolve seven alleged air quality violations. The alleged violations include: failure to inspect the facility within 12 months for asbestos before demolition or renovation begins; failure to provide Maricopa County with written notice of the intent to demolish or renovate where Regulated Asbestos Containing Material was greater than threshold amounts; failure to adequately wet the material and ensure it remains wet until collected and contained in preparation for disposal; failure to have all asbestos workers AHERA trained on site during asbestos removal; failure to have an on-site representative trained in the provisions of Asbestos NESHAP Regulations during active asbestos removal; failure to control visible



emissions during asbestos collection; failure to seal all asbestos-containing material in leaktight containers while wet. The alleged violations occurred at 7625 E. Camelback Road, Unit #251A in Scottsdale. Hawkeye Construction's office is located at 20685 N. 94th Drive in Peoria. The settlement amount was paid in full on October 9, 2008.

A complete list of October 2008 enforcement settlements is available on the county website at http://www.maricopa.gov/ pr_detail.aspx?releaseID=953.



Grizzly Trackout Control • P.O. Box 10970, Tempe, AZ 85284 1-800-761-0056 • www.trackoutcontrol.com

CLEAN HARBORS ENVIRONMENTAL SERVICES

Rely on Clean Harbors

Clean Harbors, North America's leading provider of environmental services, is at the forefront with a commitment to customers in all industries throughout Arizona.

Diverse Services:

- Waste Transportation & Disposal
- CleanPack[®] Laboratory Chemical Packing
- Field Services
- Emergency Response
- Household Hazardous Waste Collection
- Industrial Cleaning & Maintenance Services



Arizona Service Center • 602.258.6155 • www.cleanharbors.com

Environmental, Health & Safety Seminars

Fall 2008 / Spring 2009 Course Schedule, Class Descriptions, & Registration Fees, are available online @ www.poly.asu.edu/seminars/



OSHA, DOT, and EPA COURSES

Courses provided include:

- HazWOpER (40-Hr. & 8-Hr. Refresher)
- Hazardous Materials Transportation (49 CFR & IATA, Initial & Refresher)
- RCRA Regulation & Compliance (Initial and Refresher)
- Clean Air Act Regulatory Compliance
- Water Quality Laws & Requirements
- Emergency Response Technician Level
- Emergency Response to Terrorism

Register online @ www.poly.asu.edu/seminars/

Please contact Hal Berkowitz (480) 727-1323 for information on site specific courses. For registration information please contact Denise Kolisar @ (480) 727-1825

Our 20th year of providing regulatory compliance training courses.





PROSPECTING: For Environmental

Business Client Relation Management Systems

When I made the painful leap from Daytimer to Palm Pilot about 8 years ago I quickly discovered the power of electronic tracking of sales, marketing and client maintenance. Since then, the number of tools for sales people has grown significantly. The days of "ACT!" dominating the market are over. Hundreds of remarkably affordable, feature-rich software solutions are flooding the market, and we're officially out of excuses for sticking to the old three-ring binder.

So, now that you're shopping for sales and marketing software, how do you weed through all of the choices? Picking a package for yourself is relatively easy: just look around for a tool that does what you want within your price range and go for it. Establishing a tool to be deployed across your whole company is different matter, entirely – one that can quickly turn into a corporate-wide initiative. Over the last 10 months, I've worked on a pilot team to deploy a company-wide CRM to a 1,600 person company with sales and marketing personnel across the country. In this issue of Prospecting, I share some lessons learned.

Deciding on a company-wide CRM is far more complex than choosing a personal one. You can configure personal software any way you like and tailor it to fit all the idiosyncrasies of even the most unusual daily work life. As the number of people using a common system grows, so do the challenges. The processes must then be more generic, flexibility diminishes and your ability to make the software fit the specific needs of each individual deteriorates. If you establish a system that is simple, very easy to learn, and low in price, chances are you will sacrifice functionality. If the system is very complicated and full of features, you might sacrifice ease of use. The key is determine what you do (and do not) need from your system.

What are your organization's objectives for the new system? Will it be used only by sales and marketing, or will it be linked to the company's enterprise system? This is important because complications can arise due to differing needs of departments outside of sales and marketing. Is the intent to provide information about key activities and opportunities, or to track detailed day-to-day sales activities and replace each person's individual system? This can get tricky, depending on the management philosophy of the company and how closely management wants to monitor activities. How will we implement training? Resistance to change makes any company-wide initiative a challenge, and the manner in which it is announced and rolled out to front line users is critical in making sure it gets used.

The products are many and there's something to fit any organization at any budget. As long as you identify what you want



from the system, first – who will be using it, what types of information you want to distribute and gather, and how it will be presented to the users – you can more easily pick one that will enhance productivity.

Joe Holmes is the Regional Manager of Business Development at ATC Associates. He can be reached at joe.holmes@atcassociates.com. Joe C. Holmes

Apache Powder Superfund Site Wetlands

n November Apache Nitrogen Products, Inc. celebrated two major milestones: 1) the 10th anniversary of the constructed wetland used to treat nitrate-contaminated groundwater and 2) EPA's issuance of a

Preliminary Close-out Report concluding that all remedies have been implemented. Apache has accomplished "Construction Complete" and is now in routine operation and maintenance.

The wetland has been operating year-round since 2004, treating 1 million gallons per week. Concentrations of nitrate in the extraction well

have dropped from over 200 ppm to less than 70 ppm. The nitrate concentrations in the discharge are consistently less than 10 ppm, usually between 1-2 ppm.

The celebration included a wetland seminar at the Manning

House on November 12th and a ceremony and cookout at the wetland on November 13th. About 50 attended the seminar to hear presentations about the Apache wetland and other related topics. They heard from speakers from the Central Arizona Project, The Nature Conservancy and Pima County Natural Resources among others.

Over 100 people attended the wetland celebration including neighbors, regulators and environmental professionals. Attendees were brought to the wetland by horse and buggy. Once there they learned about the Superfund site through displays and hands-on activities. They had time to stroll to the top of the wetland or sit and enjoy the cowboy music and poetry of the Katy Creek Band. Members of the technical team shared about the challenges and excitement of staring the wetlands and members of management acknowledged the great success of the Apache Superfund project.

The Apache technical team included Andria Benner (EPA Region IX), Bill Ellett (ADEQ), Joan Thullen (USGS), Pamela Beilke and Greg Hall (Apache Nitrogen), Robert Gearheart (Humboldt State University), Phil Whitmore (CH2MHill), and Leo Leonhart, Eric Roudebush, Beth Ann Scully and Amy Milsom (Hargis + Associates).

Photographs and text courtesy of Pamela Beilke and Apache Nitrogen Products, Inc.



Designed to Blend; Built to Last

The world over, ARCADIS is known for designing sustainable solutions that harmonize infrastructure with environment to provide life's necessities.

Now and into the future.

As a partner, we are committed to generating sustainable, environmentally responsible solutions that improve the quality of life for everyone. As an industry leader, we balance needs with nature; providing total facility management services that protect and enhance the human habitat today...and tomorrow.



www.arcadis-us.com Scottsdale, Arizona: 480.905.9311 Phoenix. Arizona: 602.438.0883





A World Leader In Environmental Services and Chemical Distribution

ChemCare[®] is a comprehensive waste management and disposal service from Univar USA.

You can depend on Univar to help you select the most economical and environmentally sound waste disposal technology available anywhere. We manage and dispose of your hazardous and non-hazardous waste products safely, quickly and efficiently.

Univar - Phoenix 50 S. 45th Street Phoenix, AZ 85043-3907 1-800-909-4897 Univar - Tucson 3791 E. 43rd Place Tucson, AZ 85713-5403 1-800-909-4897

For more information, please call us or visit our Web sites <u>www.univarusa.com</u> or <u>www.chemcare.com</u>

