

HazTech

T R A N S F E R

Great Plains-Rocky Mountain Hazardous Substance Research Center

May waste remediation conference to highlight 10 years of progress

The Great Plains/Rocky Mountain Hazardous Substance Research Center will hold its tenth annual Conference on Hazardous Waste Research at Kansas State University, Manhattan, Kansas, May 23- 24, 1995. The theme of this year's conference is "10 Years of Progress: Solving Old Problems and Preventing New Ones."

Guest speaker at the opening day noon luncheon will be Melinda McClanahan, director, U.S. EPA Office of Exploratory Research. The title of her address is "A New Beginning for Research Grants and Fellowships."

One of the highlights of conference discussion will be phytoremediation—the use of plants to remediate contaminated soils. Features on this topic include an afternoon session with numerous papers and a full-day workshop in conjunction with the conference.

Topics covered in other sessions over the two-day period include nonaqueous phase liquids, pollution prevention/waste minimization, bioremediation, fate and transport, and a variety of related topics.

Workshops planned in conjunction with the conference include Bioremediation of Munitions-Contaminated Soil, and a HAZWOPER 8- Hour Refresher Course on May 22; and Designer Chelators: Study of Structure-Activity Relationships to Identify Ideal Chelators, Environmentally Conscious Printing, and Beneficial Effects of Vegetation in Contaminated Soils on May 25. A special Minority Academic Institutions (MAIs) workshop for investigators and fiscal managers is scheduled at the end of the conference.

HERS advisory board makes funding recommendations

The Haskell Environmental Research Studies Center (HERS) Advisory Board met for the first time on January 26-27, 1995, at Haskell Indian Nations University. The HERS Board serves to provide advice on activities of the Native American and Other Minority Institutions (NAOMI) Program, a joint program of HERS and the HSRC.

The two-day meeting began on Thursday morning with the viewing of an introductory video on Haskell Indian Nations University. The board then embarked on a campus tour. Stops included the Haskell Welcome Center, the Department of Natural and Social Sciences, the GIS Computer Lab and the Video Production Studio. Later, several board members gave on-camera interviews regarding environmental concerns in Indian Country. The afternoon was spent in attendance at two seminars on the Haskell campus: "Available Resources in Minerals and Environmental Technology at the US Bureau of Mines," by Glenn Horter and David Price and "Envi-

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HSRC approves new projects for funding

The HSRC Science Advisory Committee recommended 15 new projects for funding at its meeting on Oct. 27 and 28 in Denver, Colo. Many of these projects, along with others already recommended, are being funded and will begin in May 1995. Some of these projects are being supported by funds from the R2D2 program which has been developed in cooperation with the Department of Defense. A list of the newly funded projects follows:

93-02 The Role of Metallic Iron in the Biotransformation of Chlorinated Xenobiotics, P.J. Alvarez, Gene Parkin, and J.L. Schnoor, University of Iowa.

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April 1995

Serving society efficiently and effectively

Ten years ago, hazardous waste problems were growing and the need for research was evident. In response to this situation, many new research programs have been established and much progress has been made.

The EPA established five hazardous substance research centers in 1989. These centers have conducted applied research in support of fundamental problems; center investigators and others have made major advances in developing technologies to remediate contaminated soil and ground water.

For example, bioremediation processes have been developed, demonstrated, and used at field sites. More effective operational procedures, better design methods, and greater reliability are now available for many applications. Each of the centers has several significant success stories as a result of its research activities. The five centers are serving society efficiently and effectively.

A continuing challenge for the centers is to find

effective methods to move new developments from the research laboratory to the field. Publication of research results in peer review journals and presentations at professional meetings are well-established methods to communicate research results.

However, additional technology transfer activities are often necessary as well. Field demonstrations or testing of new processes can accelerate acceptance by regulators, consultants, and vendors. Workshops can help communicate the science behind a new technology. Information on process performance, reliability and cost is of great interest to those who wish to use new technology.

Center investigators should know who is interested in their work and have a technology transfer plan to communicate their results efficiently and effectively.

Larry E. Erickson
Center Director

HERS advisory board makes recommendations

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ronmental Impacts of Gold Mining Operations on the Fort Belknap Reservation," by board member Rose Main. Board members also had the opportunity to meet with HINU students during a break between seminars.

The second day was spent in formal meetings reviewing preproposals and applications for funds.

Pre-Proposals

Based on recommendations from the board, full proposals will be requested from these individuals:

Glenn Black, Fort Peck Community College
Dan Burns, Northwest Indian College
Ravindra Srivastava, Navajo Community College
Ben Whiting, Sinte Gleska Univ.

Summer Cooperation Program

Based on recommendations from the board, the following individuals have been approved for participation in the Summer Cooperation Program:

Nagalingam Balakrishnan, United Tribes Technical College
Jamison Bear, Haskell Indian Nations University
Andrew Hargrove, Norfolk State Univ.
Purushottam Kale, Alabama A&M Univ.
William Nichols, Blackfeet Community College
Zohrab Samani, New Mexico State Univ.
Ravi Sinha, Elizabeth City State Univ.

Conference Funding

Based on recommendations from the board, the following individuals have been approved for fund-

ing assistance to the tenth annual Conference on Hazardous Waste Research:

Nagalingam Balakrishnan, United Tribes Technical College
Jorge Gardea-Torresdey, Univ. of Texas-El Paso
Andrew Hargrove, Norfolk State Univ.
Purushottam Kale, Alabama A&M Univ.
Ray Kenny, New Mexico Highlands Univ.
Zohrab Samani, New Mexico State Univ.
Ravi Sinha, Elizabeth City State Univ.
Kirk Tieman, Univ. of Texas-El Paso

HSRC is on the 'Net

If you have access to a World Wide Web browser, you can get up-to-date information on all of the HSRC programs.

Point your browser to: <http://www.engg.ksu.edu/HSRC> and you can access our annual report; a summary of our current research, training and technology transfer projects; the program for the 10th annual Conference on Hazardous Waste Research; read about other HSRC initiatives and even read this issue of *HazTech Transfer*.

Watch for new additions, including a searchable index across all HSRC projects and publications, an abstract database, the complete HSRC Repository listing, and electronic versions of last year's conference proceedings. If you have a project home page related to HSRC research, send e-mail to hsrc@engg.ksu.edu along with the URL.

Center picks new projects

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93-05 The Use of Vegetation to Enhance Bioremediation of Surface Soils Contaminated with Pesticide Wastes, Joel R. Coats and Todd A. Anderson, Iowa State University.

93-06 Fate and Transport of Heavy Metals and Radionuclides in Soil: The Impacts of Vegetation, A. Paul Schwab, Kansas State University.

93-07 Vegetative Interceptor Zones for Containment of Heavy Metal Pollutants, Gary Pierzynski, Kansas State University.

93-12 Acid Producing Metaliferous Waste Reclamation by Material Reprocessing and Vegetative Stabilization, Frank F. Munshower, Montana State University.

93-21 Field Scale Bioremediation: Relationship of Parent Compound Disappearance to Humification, Mineralization, Leaching, Volatilization or Transformation Intermediates, Ronald C. Sims, Utah State University.

93-22 Chelating Extraction of Heavy Metals from Contaminated Soils, A.P. Hong, University of Utah.

93-24 Application of Anaerobic and Multiple-Electron-Acceptor Bioremediation of Chlorinated Aliphatic Subsurface Contamination, Gene F. Parkin, University of Iowa.

94-02 Application of PGNAA Remote Sensing Methods to Real-Time, Non-Intrusive Determination of Contaminant Profiles in Soils: Richard E. Faw, Kansas State University.

94-05 Design and Development of an Innovative Industrial Scale Process to Economically Treat Waste Zinc Residues, Thomas J. O'Keefe, University of Missouri-Rolla.

94-07 Trichloroethene (TCE) Cometabolism in Fluidized-Bed Bioreactors, Robert L. Segar, University of Missouri-Columbia.

94-08 Remediation of Soil Contaminated with Wood-Treatment Chemicals (PCP and Creosote), Rakesh Bajpai, University of Missouri-Columbia.

94-09 Effects of Surfactants on the Bioavailability and Biodegradation of Contaminants in Soils, William P. Inskeep, Montana State University.

94-11 Contaminant Binding to the Humic Factor of Soil Organic Matter, James A. Rice, South Dakota State University.

94-12 Development of a Systematic Methodology for Optimally Designing Vegetative Systems for Remediating Contaminated Soil and Ground Water, John C. Tracy, South Dakota State University.

94-24 Identifying Ground-Water Threats from Improperly Abandoned Boreholes, Robert F. Kubichek, University of Wyoming.

94-25 Uptake of BETX Compounds and Metabolites by Hybrid Poplar Trees in Hazardous Waste Remediation, Jerard L. Schnoor, Louis A. Licht, and Joel G. Burken, The University of Iowa.

94-26 Biofilm Barriers for Waste Containment, John P. Turner, University of Wyoming.

94-27 Plant Assisted Remediation of Soil and Ground Water Contaminated by Hazardous Organic Substances: Experimental and Modeling, Lawrence C. Davis and Larry E. Erickson, Kansas State University.

94-28 Evaluation and Modeling of Subsurface Biobarrier Formation and Persistence, Al B. Cunningham, Montana State University.

94-29 Extension of Laboratory Validated Treatment and Remediation Technologies to Field Problems in Aquifer Soil and Water Contamination by Organic Waste Chemicals, Tissa H. Illan-gasekare, University of Colorado.

Consortium Directory

Key personnel at each university are:

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HSRC takes informaton from lab to field

In this issue, rather than highlight a single project, Project Profile examines the HSRC's technology transfer program and how it can help bring new technology to the field for use in remediating hazardous waste sites.

Technology: The application of science, esp. to industrial or commercial objectives. (Webster's II New Riverside University Dictionary, The Riverside Publishing Co.)

The line between research and technology is a wide gray one. How can research conducted by HSRC researchers be of use to decision makers in the field? The answer requires knowledge of two separate but equally important process functions: technology development, and environmental (regulatory) decision making.

Technology development

Technology development as a process is complex. Fundamental research like that conducted by HSRC researchers is only the first step. Once the theoretical work is completed, bench and pilot scale work may commence. This is usually the end of involvement by academic researchers.

With projects like the Libby, Mont., Superfund Site: Prepared-Bed Bioremediation in Buried Lifts as Affected by Oxygen Concentration in Soil Gas, R. Sims, Utah State, and Bioremediation of Petroleum Contaminated Soil Using Vegetation, M.K. Banks, A.P. Schwab, and R.S. Govindaraju, Kansas State University, the HSRC is moving into the next stage of technology development: field demonstration projects. These field demonstrations provide necessary cost and performance data needed by environmental policy decision makers. Without this data, science rarely becomes technology.

Another step is commercialization. This can occur either before, after or during any of the other phases of research. Until a vendor realizes the potential of a technology and is willing to provide the capital and resources necessary, further development is unlikely.

The next step in technology development is full scale field implementation. For every remediation technology there must be a first site at which it is deployed. This will require agreement between the technology vendor, the regulatory agency, the responsible party, and all other stakeholders. Obtaining such an agreement is never easy. Implementing an innovative technology is often easier at a site under state regulatory authority or a state voluntary cleanup program. It is only at this stage that the technology's performance can be adequately measured for the purposes of implementing

the technology at other sites.

The final step occurs over time. Once a technology has been used full scale on an existing site, the road is paved for applications at other sites. After several successful applications, the technology becomes an accepted technology rather than an innovative (and unproved) one.

Regulatory decision making

The remedy selection process for the Superfund program is sometimes difficult to understand.

Once a site has been identified as a potential Superfund site, it is scheduled for a Preliminary Assessment and Site Investigation (PA/SI). These short cursory site visits provide the initial information needed to determine if further action is warranted. During this stage, limited sampling is done to determine if significant contamination exists. If this is the case, a more in-depth Listing Site Investigation (LSI) is completed to compile information needed for the Hazard Ranking System (HRS). If the site scores high enough on the HRS, it is a potential candidate for the National Priority List (NPL).

The Remedial Investigation and Feasibility Study (RI/FS) comprise the in-depth investigation phase of the remedy selection process. The RI/FS includes the Risk Assessment, and should provide sufficient information to select from available potential remedies, including innovative technologies.

It is during the RI/FS that important information will come to light, and the basis for the remedy selection decision will be made. In Superfund, nine evaluation criteria are used to select among remedy options. Innovative technologies often suffer by comparison to ready-to-implement technologies particularly in the five balancing criteria. Since innovative technologies have little track record, there will obviously be some implementability problems. Often innovative remediation technologies will take much longer to implement reducing their short-term effectiveness, and further weighting the decision making toward existing technologies. Finally, responsible parties are often reluctant to proceed with innovative technologies because of cost. Although there is a potential cost savings in using many innovative technologies, Superfund liability is such that if the innovative technology fails, the company is still liable for the cost of cleanup using an existing (and often more expensive) technology.

When the RI/FS is complete, the lead agency will develop a proposed plan identifying both the agency's preferred remediation alternative, and why it was selected over other options. The plan is then released for a 30 to 60 day public comment period.

During this period there is a public hearing. Following the formal comment period, the lead agency will release the final Record of Decision (ROD) including a responsiveness summary that addresses comments presented during the comment period and at the public hearing. Following remedy selection, the project proceeds to Remedial Design and then Remedial Action (RD/RA).

The HSRC's role

These two process paths contain conflicts. The question then becomes what is the role of the HSRC in resolving these conflicts to advance the selection of innovative technologies in Superfund cleanups. We have a clear responsibility to be involved in this process through our technology transfer program. The question is how best to allocate our efforts to achieve maximum results.

Our approach has to date been three-fold. First, we've expanded our research efforts to encompass more applied research and expanded our work into field demonstration projects. Second, we have developed technology transfer and training programs designed specifically to inform academic, government and private sector employees in the

use of innovative techniques and technologies. And finally, we are nurturing commercialization through our industrial partners program.

The Nine Criteria

Threshold Criteria

- Overall protectiveness of health and the environment
- Applicable and relevant and appropriate requirements (ARARs)

Balancing Criteria

- Long-term effectiveness and permanence
- Short-term effectiveness
- Cost
- Reduction of toxicity, mobility and volume through treatment
- Implementability

Modifying Criteria

- State acceptance
- Community acceptance

Although the projects described in this article have been funded in part by the U.S. Environmental Protection Agency under assistance agreement R-815653, through the Great Plains-Rocky Mountain Hazardous Substance Research Center, it has not been subjected to the agency's peer and administrative review and, therefore, may not reflect the views of the agency. No official endorsement should be inferred.

HSRC *Update* on center activities

Panel presentation at conference

Members of the Haskell Environmental Research Studies (HERS) Advisory Board will be making a panel presentation at the tenth annual Conference on Hazardous Waste Research.

The panel will be speaking on environmental problems on reservation lands that training or technology could address.

Panel presenters tentatively include HERS Advisory Board Chair Don Aragon from the Wind River Environmental Quality Commission, Kim Clausen from the Office of Natural Resources of the Oglala Nation and Steve Semken from Navajo Community College.

Summer conference set for July

The Five Centers Summer Conference has been scheduled for Sunday evening, July 23, through Wednesday noon, July 27, at the Salishan Lodge on the Oregon Coast, Lincoln City.

Center personnel, faculty, and graduate students are invited to attend. A planning committee is working on an agenda and further conference details.

JHM special issue to be available; orders due April 20

Copies of the Proceedings of the ninth annual

Conference on Hazardous Waste Remediation are still available for \$50 each.

Also available for a limited time though the Center for Hazardous Substance Research are copies of the special issue of the Journal of Hazardous Materials, featuring selected papers from the ninth annual Conference on Hazardous Waste Remediation at a discounted cost of \$50 each.

Those who wish to do so may purchase both publications for \$80, but orders for the Journal of Hazardous Materials must be received by April 20.

Contact Carla Wolfe at 913-532-6519 to place an order, or for more information.

Fan earns first honor

L.T. Fan, distinguished professor and head of the chemical engineering department, is the first recipient of the Engineering Excellence Award from Kansas State University College of Engineering.

Fan is being recognized for individual achievement in research excellence for work performed during the last five years. He has been an HSRC investigator for the past six years.

Fan's technical articles cover numbers fields, including particulate science and technology, chemical reaction engineering, biochemical engineering and biotechnology, pollution control and systems of engineering.

O'Keefe works to recover metals from wastes

"The Department of Metallurgical Engineering at University of Missouri-Rolla has been involved in the treatment and recovery of metals from hazardous wastes for about the past fifteen years. Our interest in this area has grown steadily, and there is little doubt that solving environmental problems associated with metals production is one of the primary concerns of our industry." So says Tom O'Keefe, professor of metallurgical engineering and senior research investigator at the Graduate Center for Materials Research at the University of Missouri-Rolla (UMR).

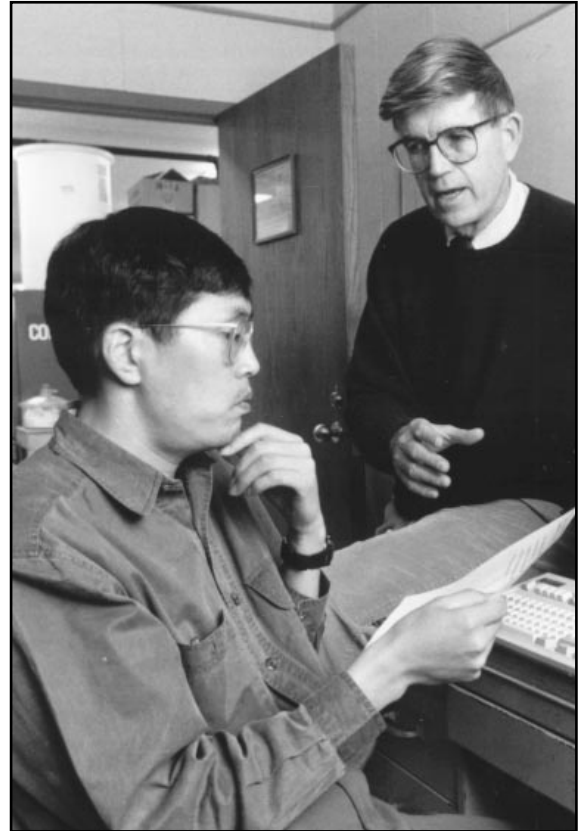
O'Keefe will be undertaking further research on the recovery of metals with funding from the HSRC in his project "Design and Development of an Innovative Industrial Scale Process to Economically Treat Waste Zinc Residues." This project has been approved and is expected to begin receiving funding in May 1995. O'Keefe's new project builds on fundamental studies that he conducted under HSRC funding.

His first HSRC-funded project, which was completed in 1991, examined the applicability of conventional extractive processes for the treatment of certain waste products. His second HSRC-funded project was aimed at developing auxiliary electrochemical processing technology to successfully treat solid wastes which contain lead as a primary contaminant. Research conducted by O'Keefe and others at UMR has resulted in a patented hydrometallurgical procedure which has been demonstrated in the lab, as a pilot, and on a commercial basis at a small industrial residue treatment plant.

The main goal of O'Keefe's new project is to design a flow sheet to treat waste zinc residues which are generated at an electrolytic zinc plant which produces about 100,000 tons of primary metal per year. The specific operating parameters which are needed to make the flow sheet a reality will be generated in laboratory studies. Galvanic stripping will be used to remove iron impurities.

O'Keefe initially attended the U.S. Naval Academy in Annapolis, Maryland. Although he was not familiar with metallurgical engineering when he entered college, he decided upon hearing about metallurgy that it offered interesting career opportunities. He earned a bachelor's degree in Metallurgical Engineering from the Missouri School of Mines and a Ph.D. in Metallurgical Engineering from UMR.

After over 30 years in the field of metallurgical



Tom O'Keefe discusses a project with Pu Yu at the University of Missouri-Rolla.

engineering, O'Keefe says he has great admiration for the pioneering metallurgists and engineers who developed the extensive metals industry. Even though they had limited scientific direction to guide them, these pioneers accomplished much because of their dedication and persistence. "The significance and extent of their advances are truly amazing to me, considering that they were operating with so many limitations. This was particularly true in the area of electrolytic metal winning and refining."

O'Keefe counts his family as a very important part of his life. He and his wife Jane have six children and a dozen grandchildren. O'Keefe says that there's never a dull moment at his house. His three older boys are metallurgical engineers, and one of them owns a restaurant in Rolla. One of his daughters manages a hospital clinical laboratory, and the other is pursuing a management-accounting career. O'Keefe's youngest son is still in high school and vows to be anything but a metallurgical engineer.

As part of a continuing series on the holdings of the Hazardous Substance Research Center repository, following is a partial list of holdings available for checkout or interlibrary loan from Farrell Library at Kansas State University (KSU). This list is of the most recent acquisitions.

Floppy disk copies of the entire list of holdings are also available. To request a disk copy of the list, write to Repository List, HSRC, Kansas State University, 101 Ward Hall, Manhattan, KS 66506-2502, 913-532-6519, FAX 913-532-5985,

Rec# 1042. Management of Manufactured Gas Plant Sites, April 2-3, 1991, Atlanta, Georgia: Technology Transfer Seminar. 1991. 222 p.

Rec# 1041. Manufactured Gas Plants and the National Priorities List: A Technical Review. 1989. 63 p.

Rec# 1040. Biological Treatment of Soils Containing Manufactured Gas Plant Residues: Topical Report (June, 1988 - February, 1990). 1990. 152 p.

Rec# 1039. Smith, John R. Co-Treatment of Manufactured Gas Plant Site Groundwaters with Municipal Wastewaters Remediation Technologies, Inc.: Final Topical Report June 1987-August 1988. Chicago, IL: Gas Research Institute; 1988.

Rec# 1038. Membrane Treatment of Wood Preserving Site Groundwater by SBP Technologies, Inc.. Cincinnati, OH: U.S. EPA; 1993.

Rec# 1037. Accutech Pneumatic Fracturing Extraction and Hot Gas Injection, Phase I. Cincinnati, OH: U.S. EPA; 1993.

Rec# 1036. Resources Conservation Company B.E.S.T. Solvent Extraction Technology. Cincinnati, OH: U.S. EPA; 1993.

Rec# 1035. Bioremediation of Hazardous Wastes. Ada, OK: U.S. EPA; 1992. EPA/600/R-92/126; 119 pg.

Rec# 1034. Miller, Christopher Martineau. Filter Media Surface Catalyzed Hydrogen Peroxide Decomposition and Oxidation of Selected Organics. Iowa City, Iowa: University of Iowa; 1992. Thesis; 184 pg.

Rec# 1033. Shurtliff, Mathew Michael. Aerobic Biotransformation of Trichloroethylene by a Phenol-Induced, Mixed Culture. Iowa City, Iowa: University of Iowa; 1992. Thesis; 98 pg.

Rec# 1032. Hughes, Joseph Blake. Anaerobic Biotransformation of Chlorinated Aliphatics: Interactions with Primary Substrate Utilization and Effect of Mixtures. Iowa City, Iowa: University of Iowa; 1992. Thesis; 250 pg.

Rec# 1031. Aoki, Danielle Fumiko. Uptake of Arsenic and Cadmium in Mine Tailings by Poplar Trees. Iowa City, Iowa: University of Iowa; 1992.

Rec# 1030. Mogallapu, Sudhir. Analysis of a Waste Management Option for Titanium Electrochemical Machining. Lincoln, NE: University of Nebraska; 1992.

Rec# 1029. Venkatraman, Ananthkrishnan. Applications of Mass Spectrometry in Monitoring Incineration Processes. Manhattan, KS: Kansas State University; 1992. Thesis; 110 pg.

Rec# 1028. Menon, Ravinder. Adsorption of Mercury Vapor by Granular Activated Carbon. Logan, Utah: Utah State University; 1991. Thesis; 127 pg.

Rec# 1027. Wang, Jenchie. Migration of PCP in Soil-Columns in Presence of A Nonaqueous Phase. Columbia, MO: University of Missouri; 1992. Thesis; 123 pg.

Rec# 1026. Zhang, Shiyong. Biological Detoxification of Mercury Contaminated Soil. Logan, Utah: Utah State University; 1991. Thesis; 63 pg.

Rec# 1025. Currence, Daniel W. Biodegradation of Pentachlorophenol by Mixed Bacterial Culture. Columbia, MO: University of Missouri; 1992.

Rec# 1024. Dave, Samir. Use of Chemical Speciation to Determine the Leachability of Lead Mine Tailings. Columbia, MO: University of Missouri; 1991. Thesis; 76 pg.

Rec# 1023. Swanson, R. Lawrence; Roethel, Frank; Stein, Christopher. Project Summary: Stabilized Incineration Residue In Shore Protection Devices. Buffalo, N.Y.: SUNY at Buffalo; 1992. 15 pg.

Rec# 1022. Fountain, John C.; Hodge, Dennis S. Project Summary: Extraction of Organic Pollutants Using Enhanced Surfactant Flushing—Initial Field Test (Part I). Buffalo, N.Y.: SUNY at Buffalo; 1992. 9 pg.

Rec# 1021. Bungay, Henry; Clesceri, Lenore; Holmes, David. Project Summary: High-Rate Metabolism of Toxic Substrates. Buffalo, N.Y.: SUNY at Buffalo; 1992.

Rec# 1020. Collins, Anthony G.; DePinto, Joseph V. Project Summary: Utilizing A Rule-Based Expert System for Minimizing Industrial Hazardous Waste: A Demonstration Project. Buffalo, N.Y.: SUNY at Buffalo; 1992.

Rec# 1019. Zimmie, Thomas F. Project Summary: Effect Of Freezing on the Permeability of Cover Soils Used for Remediation of Inactive Hazardous Waste Sites and Landfills. Buffalo, N.Y.: SUNY at Buffalo; 1992. 9 pg.

Rec# 1018. Avedisian, C. Thomas. Project Summary: Experiments on Atomization and Blending Strategies for Optimizing the Incineration of Liquid Hazardous Wastes. Buffalo, N.Y.: SUNY at Buffalo; 1992. 11 pg.

Rec# 1017. Ryan, Michael. Project Summary: Hazardous Waste Reduction Research Needs in New York State. Buffalo, N.Y.: SUNY at Buffalo; 1992. 12 pg.

Rec# 1016. Weber, A. Scott. Project Summary: Effect of Interspecies Competition on Hazardous Waste Degradation by Bacterial Supplements. Buffalo, N.Y.: SUNY at Buffalo; 1992. 14 pg.

Rec# 1015. Proceedings of the 8th Annual Conference on Hazardous Waste Research. Manhattan, KS: Kansas State University; 1993 May 25. 404pg.

Rec# 1014. Proceedings of the Conference on Hazardous Waste Research, University of Colorado, Boulder, CO. Manhattan, KS: Kansas State University; 1992 Jun 1. 619pg.

Rec# 1013. Proceedings of the Conference on Hazardous Waste Research, vol. 1 & 2. Manhattan, KS: Kansas State University; 1990 May 21. 925pg in 2 vols..

Rec# 1012. Proceedings of the Conference on Hazardous Waste Research. Manhattan, KS: Kansas State University; 1988 May 25. 446pg.

Rec# 1011. Proceedings of the Conference on Hazardous Waste Research. Manhattan, KS: Kansas State University; 1987 May 20. 137pg.

Rec# 1010. Bioremediation: A Video Primer [VSH cassette]. Ann Arbor, MI; 1993. VHS Tape.

Rec# 1009. Research into the Use of Normal and Genetically Engineered Trees for In Situ Bioremediation. Kansas State University; 1993. VHS Tape.

Rec# 1008. Beneficial Effects of Vegetation in Nonpoint Environmental Management. Kansas State Univ; 1993 Apr 8. VHS Tape.

Rec# 1007. Role of the Kansas Department of Health and Environment and Environmental Protection. Kansas State University; 1993 Feb 25. VHS Tape.

Rec# 1006. Bioventing for Soil Remediation. Kansas State University; 1993 Feb 11. VHS Tape. 1 hr.

Rec# 1005. Executive's Approach to Managing Risky... Part Five. ; 1990 Sep 26. VHS Tape. 55:00.

Rec# 1004. Executive's Approach to Managing Risky... Part Four. ; 1990 Sep 26. VHS Tape. 45:00.

Calendar

Apr. 11-13 – Mine Design, Operations & Closure Conference, Whitefish, MT; MWTP Training & Education, Montana Tech, 406-496-4311.

Apr. 27 – Hazardous Materials Shipping Workshop, Columbia, MO; University of Missouri-Columbia, John Atkinson, 314-882-8880.

May 3 – Project Designer Refresher, Overland Park, KS; Center for Environmental Education and Training, Barbara Miles, 913-897-8549.

May 4 – Contractor/Supervisor Refresher, Overland Park, KS; Center for Environmental Education and Training, Barbara Miles, 913-897-8549.

May 5 – Inspector/Management Planner Refresher, Overland Park, KS; Center for Environmental Education and Training, Barbara Miles, 913-897-8549.

May 15-19 – 40-Hour HAZWOPER Refresher, Columbia, MO; University of Missouri-Columbia, John Atkinson, 314-882-8880.

May 16-19 – Lead Abatement Training for Supervisors and Contractors, Olathe, KS; Center for Environmental Education and Training, Stacy Milliman, 913-897-8524.

May 16-20 – Contractor/Supervisor Initial Training, Overland Park, KS; Cen-

ter for Environmental Education and Training, Barbara Miles, 913-897-8549.

May 17 – HAZMAT 8-Hour Refresher, televised to Columbia, MO, Kansas City, MO, St. Louis, MO, and Rolla, MO; John Atkinson, University of Missouri-Columbia, 314-882-8880.

May 18 – HAZMAT HM181/126, televised to Columbia, MO, Kansas City, MO, St. Louis, MO, and Rolla, MO; John Atkinson, University of Missouri-Columbia, 314-882-8880.

May 22-25 – **Tenth Annual Conference on Hazardous Waste Research, Manhattan, KS; Kansas State University, Carla Wolfe, 913-532-6519.**

May 31 – Project Designer Refresher, Overland Park, KS; Center for Environmental Education and Training, Barbara Miles, 913-897-8549.

June 1 – Contractor/Supervisor Refresher, Overland Park, KS; Center for Environmental Education and Training, Barbara Miles, 913-897-8549.

June 2 – Inspector/Management Planner Refresher, Overland Park, KS; Center for Environmental Education and Training, Barbara Miles, 913-897-8549.

June 5-8 – Selenium: Mining, Reclamation and Environmental Impacts

Symposium-American Society for Surface Mining and Reclamation, 12th Annual Meeting, Gillette, WY; University of Wyoming, George Vance, 307-766-2297.

June 13-14 – Real Estate Phase I Site Assessment (ASTM), Denver, CO; University of Missouri-Columbia, John Atkinson, 314-882-8880.

June 26-30 – Inspector/ Management Planner Initial Training, Overland Park, KS; Center for Environmental Education and Training, Barbara Miles, 913-897-8549.

July 22-27 – Separation Technology VI: Advances and Opportunities in Environmental Separations, Snowbird, UT; Georgia Institute of Technology, Ronald W. Rousseau, 404-894-2867, or Charles A. Eckert, 404-853-9344.

July 30-Aug. 3 – AIChE 1995 Summer National Meeting, Planning for a Responsible 21st Century, Boston, MA; University of Utah, Russ Price, 801-585-3277.

Aug. 14-14 – Hydrologic Evaluation of Landfill Performance Modeling Workshop, Denver, CO; Colorado School of Mines, 303-273-3321.

HazTech

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