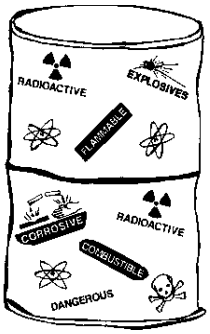

MIXED MESSAGES

ASME Mixed Waste Committee Newsletter

Volume 11 No. 1 **February/March 2001**

A Message from the Chair

As the mixed waste community prepares to gather once again in Tucson with colleagues with interest in other less exciting waste streams, we find some mixed waste issues solved or nearly so, and some unresolved. The Mixed Waste Committee is sponsoring a one-day short course on Sunday at Tucson that will cover some of these issues (see announcement below). The big item this year is the rulemaking the EPA is ready to issue as final. It is currently in the last review and approval step. Although it is not known how EPA has chosen to address the comments that were received now one year ago, the rule should provide some relief from dual regulation for licensees with respect to storage, treatment and disposal of mixed waste. Note that the relief is only for licensees, not DOE. They continue to operate under the site treatment plan process with negotiated agreements with their regulators that are periodically revisited. One of the issues for the DOE sites, of course, is the timing for availability of mixed waste disposal within the DOE complex. They are also interested in continuing progress to expand the capabilities of the commercial sector to treat mixed waste, particularly some of the problematic waste streams. If you are interested in discussing these and other mixed waste topics, including improved methods for communicating information to the mixed waste community such as using our new website (http://www.asme.org/divisions/environmental/Mixed.html), I would invite you to attend the meeting of the Mixed Waste Committee at WM '01 on Tuesday February 27th in the Show Manager's East Room of the TCC from 11 AM until 1 PM. This room overlooks the exhibit hall. Lunch will be served. If you are unable to attend but would like to know more about the MWC and its mission, please contact me at (937) 431-4707or send an email to dick_blauvelt@wpi.org.

Sincerely,
Dick Blauvelt
Chair, ASME Mixed Waste Committee

MIXED MESSAGES IS ON THE WEB:
http://www.asme.org/divisions/environmental/Mixed.html

ASME MIXED WASTE COMMITTEE HOSTS TRAINING EVENT AT WM'01

MIXED WASTE 2001- "Problems Solved and Issues UnResolved; an Executive Update"

The ASME Mixed Waste Committee will host a one-day executive update on Sunday February 25th to be held in conjunction with WM '01. For over 10 years, the ASME has been providing training and informational exchanges on Mixed Waste to the Nuclear Industry. Knowledgeable speakers from the EPA, NRC, DOE, the contractor community, the utilities and the vendor sector will be present to share the very latest information regarding effective mixed waste management. Among the topics to be addressed will be:

- Executive Overview and History of Mixed Waste Issues
- Status of Proposed Rulemakings and Other Regulatory Issues
- Examples of Innovative Treatment Technologies That Are Now Commercially Available
- Dealing with Mixed Waste in D&D Projects
- Disposal of Mixed Waste, Where, When and How Much?
- Packaging and Transportation
- Problematic Waste Streams
- Options for the Small Generator

This course will be interactive with participants sharing successes and failures in managing mixed waste and experts from the regulatory and TSD community providing valuable insight. The class will be limited to the first 60 registrants and will run from 8 AM to 4 PM at the Radisson host hotel on Broadway (previously the Holiday Inn). Lunch and a course notebook are included in the registration fee of $195. For further information contact Dick Blauvelt at dick_blauvelt@wpi.org or (937) 431-4707 or Gary Benda at Gbenda_use@hotmail.com or (803) 345-2170.

TECHNOLOGY

--- Focus Area News

NEW NAME

The Mixed Waste Focus Area is now known as the Transuranic (TRU) and Mixed Waste Focus Area (TMFA) to reflect a growing emphasis among DOE sites on readying their TRU waste for shipment to the Waste Isolation Pilot Plant-DOE's TRU waste repository near Carlsbad, New Mexico. While the focus area's mission continues to be to define technical and engineering solutions for DOE TRU and/or mixed waste problems, the TMFA program will focus more intensely on developing work packages of particular interest to the TRU community. As always, the focus area will seek strong participation from its end users, of which the TRU community is an important part. TMFA has named two field lead co-managers: Bill Owca at the Idaho Operations Office remains at the helm and is joined by Roger Nelson from the Carlsbad Field Office.

This article first appeared in the Winter 2000 edition of Initiatives in Environmental Technology Investment, a publication of WPI

TMFA WORK PACKAGES - 2001

Characterization: This work package develops solutions for challenges associated with waste characterization for the treatment, storage, transportation, and disposal of mixed wastes. Needs and problems associated with the determination of radionuclide and Resource Conservation and Recovery Act (RCRA) constituent concentrations, and the determination of process operating parameters have been identified.

Material Handling: This work package develops solutions for challenges associated with material handling, sorting and segregating associated with treatment systems, the repackaging of contact handled transuranic waste containers, and remote handled waste volume reduction and handling. The majority of the challenges addressed are from the radioactive component of the waste, and the resulting complications are due to containment and confinement requirements. Many of the systems in this product line are commercially available, but they require modification and testing prior to use in the Department of Energy transuranic and mixed waste environment. Many waste types and many process steps are included in this environment. Specific areas of focus are: a.) verification and remote removal of noncompliant items from mixed waste storage containers, b.) repackaging material from drums and small boxes, c.) repackaging material from large boxes d.) handling material in contact handled

components and processes, and e.) handling material in remote handled components and processes.

TRU Transportation: This work package develops solutions for the challenges of increasing the amount (payload expansion) of transuranic waste that can be transported using the TRUPACT-II Container (contact-handled waste) and the 72-B Cask (remote-handled waste). The amount of waste currently transportable is limited due to the potential of hydrogen gas generation during transport, and the subsequent potential for the loss of containment due to fire or explosion. Specific areas of focus are: a.) expanding the TRUPACT-II Container Payload and b.) expanding the 72-B Cask Payload based on the Safety Analysis Report for Repackaging Evaluations.

Offgas CEM: This work package develops solutions for challenges associated with regulations governing emissions of hazardous air pollutants (HAPs). In particular, the Environmental Protection Agency's Maximum Achievable Control Technology (MACT) for Hazardous Waste Combustors regulates emissions of heavy metals (Hg, Cd, Pb, As, Be, and Cr), particulate matter, organics (including dioxins and furans), and HCl and CI2. This MACT Rule will impact operation of most of DOE's thermal treatment facilities. The proposed strategy to address this challenge is to develop and demonstrate technologies for control and monitoring of emissions. Specific areas of focus are: a.) removing mercury from offgas streams, b.) removing dioxins and furans from offgas streams, c.) removing particulate matter from offgas streams, d.) measuring multiple metal emissions at the stack, e.) measuring mercury emissions at the stack, and f.) measuring dioxin and furan emissions at the stack

Alternatives to Incineration: This work package develops technology alternatives to open flame thermal treatment processes. These alternatives are required to successfully destroy organic constituents in mixed waste and to produce suitable (disposable and storable) waste forms. This work package is focused on treating (destroying organic constituents with non-flame processes) waste.

Unique Waste: This work package identifies and addresses issues associated with disposition of certain “unique”, or problematic, waste streams. These unique wastes, which represent approximately 10% of the DOE mixed waste inventory, include: a) problematic organic wastes streams (i.e. tritiated PCBs, transuranic PCBs), b) highly energetic waste streams (i.e. water reactives, pyrophorics, and high explosives), c) radioactive sources, and
d) other miscellaneous unique waste streams (i.e. batteries, non-defense TRU waste, activated lead, gas cylinders). Disposition of these waste streams will require highly specialized solutions that will be strategically implemented through various approaches including site-specific deployments, multiple site collaborations, and national initiatives.

--- Technology News

INCINERATION PHASE OUT

Incineration may be phased out as a viable treatment option for DOE mixed waste. Pressure on incinerators has come from public interest groups concerned about the risk of toxins' being released into the environment and from the U.S. Environmental Protection Agency, which has promulgated stricter treatment and monitoring requirements for air emissions. The General Accounting Office has also weighed in with evidence that DOE's incinerators are inefficient and costly due to their use at much less than full capacity.

The elimination of incineration as a treatment option would orphan tons of existing and projected organic-based mixed wastes that have traditionally been incinerated and leave sites scrambling for alternative treatments. In November 2000, DOE's Idaho National Engineering and Environmental Laboratory (INEEL) moved in this direction by closing the Waste Experimental Reduction Facility incinerator. To avoid disrupting sites' major cleanup goals, TMFA is devising a strategy for accelerating the development and deployment of alternative, lower mission technologies.

In spring 2000, Energy Secretary Bill Richardson established a blue-ribbon panel to investigate alternatives to incineration as part of an out-of-court settlement with public interest groups who filed a lawsuit to stop DOE's plan to build a mixed waste incinerator at INEEL (http://environment.inel.gov/wm/Jackson_Settlement.htm). While the panel's conclusions weren't available when this publication went to press, DOE foresees the need to accelerate and expand the development of alternatives to incineration as soon as possible.

The Office of Science and Technology (OST) has experience in fostering the development of alternatives to incineration. For more than five years, OST has sponsored R&D projects to meet site needs for destruction of mixed waste containing transuranics, mercury, or explosives -- classes of mixed waste that aren't amenable to incineration. TMFA leads OST's alternatives development team, charged with providing fully integrated non-flame treatment systems (either thermal or nonthermal) for destruction of organic matter in mixed and transuranic wastes. Other members of the development team are the Western Environmental Technology Office in Butte, Montana; the Diagnostic Instrumentation and Analysis Laboratory at Mississippi State University; Florida International University; and the crosscutting organizations: Robotics; Efficient Separations and Processing; and Characterization, Monitoring, and Sensor Technology.

Research and development activities over the next two years are crucial to the successful development of alternatives to incineration. These R&D efforts range

from basic science research to full-scale integrated demonstrations and deployments. The team plans to gather performance data on alternative technologies in four categories of maturity:

- near ready-to-start operation at a commercial site,
- ready for scale-up to treat real wastes at a commercial or DOE site,
- inadequate performance data to assess suitability as an alternative, and
- promising treatment concept.

Three general categories of emerging alternative incineration technologies will be investigated: thermal, aqueous based chemical oxidation, and separations. Side-by-side comparisons are planned to evaluate performance of different technology categories and also to evaluate performance within categories. Comparisons will be made on the bases of feed rate, residence time, pre- and post-treatment requirements, and robustness. Along with its technical approach, the team plans to work with the National Technical Workgroup on Incineration and citizen advisory boards throughout the DOE complex to build public and regulatory acceptance of the emerging technologies. OST also intends to coordinate this initiative with similar efforts, such as the Department of Defense's development of alternative chemical disposal technologies.

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ALTERNATIVES TO INCINERATION

Thermal methods

Thermal methods are relatively high-temperature alternatives (i.e., greater than 800'C) that destroy the organic component of waste through oxidation, reduction, or pyrolysis but generate significantly less off-gas than incineration. Examples include the DC Arc Melter (Tech ID 1652), steam reforming (Tech ID 273), molten metal melting (Tech ID 269), vitrification, molten salt oxidation (Tech ID 30 10), and supercritical water oxidation.

Aqueous-based chemical oxidation methods

Aqueous-based processes use strong chemical oxidizers in acid-bath-type reactors and are usually operated in the batch or semicontinuous mode. Aqueous-based processes create favorable conditions for oxidation of the organic waste to carbon dioxide. The use of strong oxidizers enables organic destruction at temperatures an order of magnitude lower than that of incineration or other thermal based alternatives (e,g., 150 to 450'C). Little or no off-gas is produced; but shredding of waste feed is required, large quantities of secondary waste are generated, and residence times are hours or days compared to

seconds or minutes with incineration. Examples include direct chemical oxidation (Tech ID 109), acid digestion (Tech ID 2167), mediated electrochemical oxidation, acid catalyzed oxidation (Tech ID 106, 2040), and solvated electron technique.

Separation methods

Separation processes remove organic contaminants from the bulk of the waste. These processes are only pretreatment steps since the removed organic component requires destruction via other methods. The advantage of this class of technology is that it can reduce the volume and complexity of the waste to be treated, but additional steps may increase waste handling and costs. Examples include commercial solvent extraction and thermal desorption.

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HANDLING AND SEGREGATING SYSTEM

Since FY98, TMFA and its partners have been developing a modular, remotely operated system to repackage 10,000 drums of TRU and TRU mixed waste at DOE's Savannah River Site (SRS) and prepare it for transport to WIPP Development of the Handling and Segregating System for 55-Gallon Drums (HANDSS-55) is aimed toward a hot deployment at SRS in FY03. HANDSS-55 (Tech ID 2336 and 2337) modules are being designed to open drums and liners, remove noncompliant items, and repackage waste into WIPP approved containers. Since each module is designed for operating individually or in integration with the other modules, this waste repackaging system will help satisfy the unique and varying needs of each waste generator, resulting in significant life-cycle cost savings. The biggest advantage of this remotely operated system is that personnel are removed from the hazardous environment.

HANDSS-55 has five modules:

- **Automated Drum and Liner Opener** opens a 55-gallon drum and the rigid polyethylene liner that contains waste. This module was demonstrated in spring 1999.

- **Waste Sorting Station** will enable visual identification and removal of items that do not comply with WIPP-acceptance criteria. The remaining compliant waste is then repackaged into WIPP-approved containers. A demonstration is scheduled for spring 2001.

- **Process Waste Reduction Module** uses a mechanical shredder to reduce the volume of the old drum and liners into small shards. The shards, along with the waste, are repackaged into WIPP-compatible containers. This module will be fabricated in spring 2001.

- **TRU Waste Repackaging Port** uses a split-plug bagless transfer system to repackage WIPP-compliant waste into a polyethylene canister. A sphincter seal and hollow plug provide contamination control. A demonstration is planned for spring 2001.

- **System Integration and Control Station** will integrate the HANDSS55 modules to operate as one unified system. Its functions will include collision avoidance, task prioritization, mobilization of the equipment, and overall system control. A cold demonstration is planned for summer 2002.

Waste Inspection Tomography

WIT is a trailer for the nondestructive evaluation and assay of waste drums based on radiographic, tomographic, and spectroscopic principles. (Two methods for characterization are contained in one mobile unit.) WIT safely and cost-effectively identifies contents, provides two- and three-dimensional information about contents, locates isotope emissions, and identifies the emitting isotope species. Characterizing transuranic waste at small generator/storage sites using mobile waste characterization technology will result in cost savings by requiring fewer waste characterization facilities to be built. Small-quantity sites, particularly closure sites, will be able to meet their milestones. In addition, mobile waste characterization systems can also supplement characterization activities at the large generator/storage sites. The WIT nondestructive assay (NDA) was recently awarded an R&D 100 Award from *R&D Magazine* (see article, page 3). The award describes WIT NDA as a "technologically significant product" for 2000.

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NEW LEAD-BASED PAINT CONVERSION (LBPC) TECHNOLOGY

Many government and commercial companies used Lead-Based Paint (LBP) on its buildings until the late 1970's thus millions of buildings potentially present a lead hazard. Historically, there have been few choices for managing LBP hazards for abandoned buildings, buildings scheduled for demolition and disposal, or buildings maintained for industrial uses except paint removal and land disposal. Non lead-based fixates have been used to encapsulate or fix the LBP in place until removal, however, this is only a delay action and does nothing to remediate the potential hazard if the protective surface is damaged. Eventually, the materials or debris with LBP has traditionally been managed, regulated, and disposed of as a hazardous or mixed waste.

A new alternative is now available from Metals Treatment Technologies L.L.C. (MT^2) that converts the lead in situ (in place) rendering the materials non-hazardous as defined by the Resource Conservation and Recovery Act (RCRA).

The LBP conversion (LBPC) process is a simple and an unregulated procedure. Materials treated will pass RCRA Toxicity Characteristic Leaching Procedure (TCLP) standards, and therefore, can be managed as non-hazardous material during and after demolition. By converting LBP prior to characterization from a potential hazardous paint to a non-hazardous paint, significant handling and disposal cost savings are obtained.

The LBPC technology is based on proven lead-phosphate chemistry in an innovative application to stabilize and convert lead in painted surfaces. The treatment method uses a latex based paint containing patented chemicals that, on a molecular level, react with the lead in the paint on contact creating an lead-phosphate mineral which is inherently stable. Standard application involves roller or spray onto the LBP surface. The conversion reaction with the lead in the existing paint is immediate upon surface contact and requires no chemical curing or set-up time beyond standard latex drying time.

The LBPC technology has been demonstrated and successfully applied at two EPA remediation projects. A U.S. Patent approval is pending.

For more information contact Jim Barthel at MT^2 at jmbarthel@aol.com (303-205-7935) or Gary Benda at US Energy at GBenda_USE@hotmail.com (803-345-2170).

OTHER

TMFA REGULATORY PROGRAM

Size doesn't necessarily define impact. TMFA's regulatory program may be one of the smallest programs at INEEL, but it's making a big difference across the DOE complex and in the regulatory community. The program ensures that DOE's mixed waste research and development activities are in compliance with not only current environmental regulations, but future regulations as well.

"Our job is to make sure our programs are positioned to hit regulatory targets in the future," said Dave Eaton, regulatory specialist. "That means understanding new rules and regulations and working closely with regulators." Quick adjustments to changing priorities are also required. The public's growing resistance to incineration has created a demand for alternative treatment technologies. TMFA's technical team and the regulatory program have been leaders in ensuring that alternative technologies will be ready when needed.

"We knew that some combustible mixed wastes are not easily incinerated," said Eaton. "Mercury-containing wastes, for example, are common across the DOE complex. We realized we needed to develop alternatives to incineration and began working on developing new technologies more than five years ago.

A close working relationship and a strong partnership with the U.S. Environmental Protection Agency has been vital to this effort. EPA has experience working with hazardous wastes, and TMFA's regulatory program assisted them in understanding the unique aspects of radioactive wastes. Recently, DOE's Office of Science and Technology and EPA's Office of Solid Waste signed a Memorandum of Understanding to improve cooperation in the research and development of technical solutions for mixed waste treatment. Three projects have been initiated.

The first project will study the effectiveness of particulate matter continuous emissions monitors to determine how they might be used to monitor the performance of HEPA-filtered systems and detect HEPA filter failure.

Another project will help determine the kinds of data required to help regulators issue a permit for new or innovative treatment technologies. EPA has not yet developed a standardized approach for demonstrating the effectiveness and failure modes for these new technologies.

A third project involves mercury pollution in DOE wastes. Mercury is very toxic, and isolating it from man and his immediate environment presents special challenges. EPA is interested in DOE's help in filling technical data gaps, which will help EPA implement its new rules.

The regulatory program also conducts national workshops and symposiums on new regulations and upcoming regulatory changes with other DOE sites. Sharing information with other sites has had beneficial results. For example, the Hanford, Sandia, and Fernald sites have recently learned that new rules for handling PCB-contaminated waste actually give them more options and opportunities than originally thought.

The complex nature of many of DOE's mixed wastes makes the job of TMFA's regulatory program intricate and challenging. In the future, regulations will keep changing and are expected to get tougher in response to public demand. "Permitting and regulations will become much more case-specific and complex, being driven primarily by site-specific risk assessments, 11 said Eaton. "We will never get to zero risk, but the public and the regulators will continue to drive us ever closer to the mark."

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UNIQUE WASTES

TMFA is forming a Waste Elimination Team to break down barriers to treatment of unique wastes (small quantities of waste at each site): resistance of the commercial sector to deploying technologies for which it sees only a marginal market, difficulties in sharing information on successful methods of waste treatment, and high costs of treating and disposing of those wastes for which commercial treatment capability exists. The team will conduct treatment campaigns in an effort to more effectively deploy previously developed and demonstrated technologies for unique wastes.

An important component of the team will be waste management personnel from sites with unique wastes. These site representatives will guide the process by informing the team of unique waste problems at their sites that the team can help resolve. Site team members who are knowledgeable about their sites' treatment milestones and budget for unique wastes will work with principal investigators and other members of the team to develop overall waste profiles and schedules for treatment and disposal. In addition to site representatives, the team will be composed of subject matter experts for the specific wastes to be addressed, principal investigators charged with dealing with a selected waste type, and TMFA technical and regulatory personnel. Vendors for deployed technologies will be consulted for schedule and waste acceptance criteria information.

TMFA held a kickoff meeting for the team to discuss projects scheduled for this year and solicit input for setting priorities for next year's projects. Projects for fiscal year 2001 include:

- a treatment campaign to eliminate elemental mercury waste inventories throughout the DOE complex using the Broad Spectrum Liquids contract with Allied Technology Group,
- a treatment campaign to eliminate <260-ppm mercury sludge and soil using the Broad Spectrum Materials and Energy Corporation (M&EC) contracts,
- a national initiative to treat gas cylinders,
- a national initiative to stabilize uranium chips,
- cooperative activity for multiple deployments of macroencapsulation technologies, and
- a treatment campaign to stabilize organic liquids, including those with RCRA metals.

While funding is in place for the above projects, sites representatives are being sought to work directly with principal investigators on projects for which their sites have an interest. Site representatives will also be obligated to participate in occasional full-team conference calls to select deployment projects for the next fiscal year. Budgets for the next few years are planned to be approximately $1.5

million for these deployment efforts. Among the problems the Waste Elimination Team may tackle in the future are waste with classified configurations, oversized boxes of TRU waste, batteries, lead with TRU contamination, and sealed sources.

In FY O1, the TMFA Unique Waste Work Package will also support other activities aimed at problems that are less universal:

- treatment of confidentially configured circuit boards using Clean Technologies' molten aluminum process at Sandia National Laboratories and
- biodegradation of high-pressure liquid chromatography wastes at Lawrence Berkeley National Laboratory.

If other sites have similar problems, TMFA will try to coordinate treatment of surrogate wastes as part of these activities. The molten aluminum process appears to be well suited to the needs of several sites.

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WEBSITES OF INTEREST

DOE TRU & Mixed Waste Focus Area:
http://wastenot.inel.gov

EPA Radiation Protection Program Mixed Waste Team:
http://www.epa.gov/radiation/mixed-waste

Environmental Assessment Division of Argonne National Laboratory (DOE):
http://www.ead.anl.gov

RadWaste (WasteLink)
http://www.radwaste.org

Enviromental Management Division of DOE:
http://www.em.doe.gov/

Initiatives in Technology Investment is available on the Internet at:
http:www.wpi.org/initiatives

CALENDAR

WM 01 Conference, Feb. 25 - March 1, 2001 in Tucson, AZ.

- **MIXED WASTE 2001- "Problems Solved and Issues UnResolved; an Executive Update,"** Sunday, Feb. 25 - see announcement on page 1.

RIC 2001 – NRC 13th Annual Regulatory Information Conference, March 12-14, 2001, Washington, DC

IT3/2001 - International Conference on Incineration and Thermal Treatment Technologies, May 14-18, 2001, Philadelphia, PA

2001 American Nuclear Society Annual Meeting, June 17-21, 2001, Milwaukee, WI

94th Annual Conference & Exhibition of the Air & Waste Management Association, Sustainable Future," June –24-28, 2001, Orlando, FL

ICEM '01, 8th International Conference on Radioactive Waste Management and Environmental Remediation, September 30 – October 4, 2001, Bruges, Belgium

MIXED MESSAGES

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Would you like to make a comment or contribute an article?

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