

Breaking the Code on Challenging Waste – 13267

John Witzeman*, Aaron White**, and Charles Estes*

*URS | CH2M Oak Ridge LLC

**U.S. Department of Energy

ABSTRACT

Mixed low-level wastes (MLLW) with no available path to treatment or disposal have been longstanding challenges for DOE facilities. Today, mixed wastes with no path to treatment or disposal frequently present themselves in the form of combinations of problematic matrixes, problematic EPA Hazardous Waste Codes, and security classification requirements.

In order to successfully treat and disposition these challenging wastes, waste management personnel must be more inquisitive and challenge the status quo more than ever before. All aspects of the waste from how it was generated to how the waste is currently being managed must be revisited. Each fact, the basis of each decision, and each regulatory determination must be investigated and validated. Since many of the difficult waste streams were generated several years ago, it can be quite challenging to locate knowledgeable generators from the time of generation. Significant investigation is often required to obtain the needed information to evaluate legacy waste streams. Special attention must be paid to the little things that may not seem central to the issues being investigated. Solutions are sometimes found in these details.

INTRODUCTION

Do to their age and cutting edge missions, DOE sites provide circumstances that result in waste being generated that is subject to unique combinations of requirements and controls, and are difficult to treat or dispose. These wastes are especially challenging because they frequently are subject to combinations of requirements that were not contemplated by the regulator and require capabilities that have not been developed by commercial treatment and disposal vendors.

When these challenging wastes are encountered, the waste management personnel responsible for getting the wastes treated and disposed must review every detail of the waste. Nothing can be assumed. Breaking the code on challenging waste involves careful evaluation of the complete history of the waste, including what would normally be considered secondary issues that do not affect treatment and disposal of the waste.

DISCUSSION

There are many different combinations of complicating factors that can impact a site's ability to treat and dispose a waste. These complicating factors typically are associated with mixed hazardous waste, mixed polychlorinated biphenyl (PCB) waste, or a combination of both. Sometimes just the difference between a waste being solid-phase or liquid-phase can be the difference between waste that can be treated and disposed, and waste that has no path to disposal. Below is a brief description and discussion of common issues that can cause waste to be difficult to treat and dispose.

Classified Waste

Classified waste regulated under the Resource Conservation and Recovery Act (RCRA) as mixed hazardous waste or regulated under the Toxic Substances Control Act (TSCA) due to PCB content can be especially difficult. A few vendors do provide the capability to treat classified waste pursuant to TSCA and the Land Disposal Restrictions (LDR) of RCRA. However, these vendors do not have the capability to provide the array of treatment technologies in a secure environment that they provide in a non-secure environment. For example, the capability to incinerate classified mixed liquid waste is not available. Liquids which are classified and contain PCB above 50 ppm or contain regulated concentrations of organics would not have incineration available to them. Classified solid-phase waste which is contaminated with regulated concentrations of organics may not have treatment capability available. This type of waste would require treatment via vacuum-assisted thermal desorption or some other technology which would destroy the organics. These technologies are also not currently available in secure facilities. As an additional complicating factor, vacuum-assisted thermal desorption would also produce a liquid-phase secondary waste that may be classified and difficult to treat.

Dioxin and Furan Waste

Treatment and disposal of mixed wastes can be complicated by the presence of dioxins and furans either in the form of dioxin- and furan-coded RCRA waste or by dioxin and furans being present as Underlying Hazardous Constituents (UHCs). Solid-phase mixed hazardous wastes which have been assigned dioxin or furan codes can be treated via vacuum-assisted thermal desorption. However, no treatment capability is available for the radioactively contaminated dioxin- or furan-coded condensate that is generated as a secondary waste from vacuum-assisted thermal desorption treatment of the waste.

Dioxin and furans are also troublesome when present in a liquid-phase waste. The combustion facility for liquid-phase waste available to most sites does not have dioxin and furan codes on its RCRA permit and does not treat dioxins or furans as UHCs above trace levels. While separating dioxins and furans from a solid-phase matrix can be accomplished using vacuum-assisted thermal desorption, treatment of the resulting liquid-phase waste is more difficult.

Solid-phase classified dioxin and furan mixed waste are subject to an additional complication. Even if the solid-phase waste is treated, it cannot be disposed. While it is well known that the Nevada Site Office (NSO) accepts classified waste for disposal at the Nevada National Security Site (NNSS), NSO cannot accept dioxin or furan-coded waste for disposal. Dioxin and furan waste codes are not on NNSS's RCRA permit.

Reactive Waste

Radioactively contaminated reactive waste poses challenges on two levels: 1) transportation safety and 2) capability to treat the waste. While some capability to treat reactive mixed waste does exist in the vendor community, these capabilities don't address all forms of reactive waste that may be encountered.

The proximity of the waste to the treatment facility also influences whether the waste can be treated. While a treatment facility may have the capability to treat a specific waste that capability is of no benefit if the waste cannot be safely transported to the facility due to transportation concerns.

STRATEGIES

Finding ways to successfully treat and dispose challenging waste is about detective work and perseverance. No stone can be left unturned. In order to find a path to treatment and disposal for challenging mixed waste, and sometimes challenging low-level waste, waste management personnel should consider the questions below. Looking deeper into problematic waste streams can reveal facts and opportunities that were not previously understood. These new facts can many times lead to a treatment and disposal solution that no one previously considered.

Process Knowledge

Begin by learning as much as possible about how the waste was generated. Assume nothing and do not rely upon any information that you have not validated. A questioning attitude is essential. Obtain all available documents associated with generation of the waste. Conduct interviews of personnel involved in generation of the waste, especially management and environmental compliance personnel. Living memory can provide you with important information about what really occurred when the waste was generated. The first-hand knowledge of personnel involved in generating a waste can provide you with facts and perspectives that have never been documented.

Obtain detailed process knowledge by determining:

- Where was the waste generated?
- How was it generated?
- Why was it generated?
- What were the conditions and activities in the area before and after the waste was generated?
- How has the waste been stored?

Representativeness of Data

If analytical data or non-destructive assay (NDA) data is available for the waste, determine if the data is representative of the waste or is biased in some form.

Determine the following:

- Was a Sampling and Analysis plan prepared?
- Were Data Quality Objectives documented?
- How were samples collected?
- How many samples were collected?
- Were samples random or directed?
- Were samples created, preserved, and documented properly?
- Was the laboratory properly qualified?

- Were the analytical detection limits low enough?
- Was the analytical data validated?

Regulatory Determinations

Review and validate that all regulatory determinations are correct. The various regulations which apply to waste are complex. It is very easy to make a mistake and inappropriately apply a waste code. The regulated community and the regulators have become more and more knowledgeable of the regulations as time has passed. The DOE complex manages waste which was generated during the infancy of regulations pursuant to RCRA and TSCA. Regulatory determinations or interpretations from the past may not be correct. Waste management personnel must work with waste generators and environmental compliance personnel to correct and document mistakes that are preventing waste from being treated and disposed.

Determine the following:

- Is the basis of any listed codes valid?
- How do you know any characteristic codes apply?
- What is the source of the contaminate that caused a waste to be characteristic?
- Was the contaminate present at the point of generation?
- What LDR requirements applied at the point of generation?

Treatment and Disposal Facility Interface

Discuss challenging wastes with treatment and disposal vendors. Personnel at the various treatment and disposal facilities talk to other waste management professionals from all over the DOE complex and outside the DOE complex. The treatment and disposal facilities may be aware of a site or company that has already solved the issue of concern.

Use competition in the marketplace to your advantage. If a treatment and disposal solution for a specific waste cannot be determined, write a scope of work and request proposals from treatment and disposal vendors. The natural forces of competition and free enterprise motivate vendors to develop solutions for problematic wastes. Companies will develop new and improved capabilities or expand the capability of existing assets when competing for work and new revenue. Competition creates an environment where everyone wins.

Validate that Waste is Really Classified

Work with site Classification officials to validate that waste is still classified. A waste that was classified when it was generated may not be classified today.

CASE STUDIES

Formerly F027 Waste

A population of classified mixed waste that had been assigned the RCRA waste code F027 (Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols (40 *CFR* 261.31)) was being evaluated for disposal. The waste complied with LDR. The only potential disposal option for the waste was NNSS because the waste was classified. NNSS could not accept the waste for disposal because dioxin and furan waste codes, such as F027, were not on NNSS's RCRA permit.

Waste management personnel worked closely with classification officials to evaluate if the waste was in fact classified. After review of the process which generated the waste, Classification officials determined that the waste was classified. Therefore, NNSS remained the only possible disposal facility for the waste.

Since the waste was, in fact, classified and could not be disposed at a commercial facility authorized to accept F027 waste, waste management personnel then began investigating the circumstances under which the waste was generated and the source of the F027 waste code. Personnel reviewed documents associated with the process from which the waste was generated and conducted multiple interviews of personnel familiar with the generating process and the original regulatory compliance basis.

Based upon the documents that were reviewed and interviews of multiple personnel, the F027 waste code was found to have been applied to the waste inappropriately. Chemicals comprised of tri-, tetra-, or pentachlorophenol were used in the process which generated the waste. However, the chemicals were used for their intended purpose. The chemicals were not "discarded unused formulations."

Waste management personnel prepared a document describing why the F027 waste code did not apply to the waste and that the F027 waste code was being removed from the waste based upon the facts presented in the document. The supervisor for the area in which the waste was generated, and the facility Director of Environmental Compliance both signed the document concurring with the conclusions in the document. The waste is awaiting shipment to NNSS for disposal as classified low level waste.

Formerly Classified Oil from Sorting and Segregation

During the process of sorting and segregating classified industrial waste, a jar of oil was identified. Sampling of the oil revealed that the oil exhibited a concentration of PCB > 50 ppm.

As no capability is available to incinerate classified PCB liquid, waste management personnel began researching the point of generation of the waste in the container from which the jar of oil was removed. The waste in the subject container was found to have been generated in a classified area. Therefore, the jar of oil was managed as classified waste.

Waste management personnel met with officials from the Classification office to review documentation for the container of industrial waste which contained the jar of oil. Classification determined that the oil was drained from a machine in the same area in which the industrial waste was generated. The oil was determined to be lube oil from the inside of the machine and that the oil could not have come into contact with classified material. Therefore, the oil was not classified. The oil was subsequently shipped for incineration at a non-secure, TSCA-authorized facility.

Reactive Waste

Reactive metals waste was shipped to one vendor for treatment. The vendor encountered safety issues while trying to treat the waste and discontinued processing the waste. The waste was subsequently returned to the East Tennessee Technology Park (ETTP) for storage until another treatment vendor could be identified.

In the period following return of the reactive waste to ETTP, no vendor with the required permits to treat the waste could be identified. Various vendors indicated that they could treat the waste as a treatability study. As no funding was available to treat the waste at the time that these discussions were occurring, the vendors were unwilling to provide pricing or to begin planning and preparation for receiving the waste.

A Request for Proposal was prepared and included scope to treat and dispose the reactive waste. Initial proposals received included potential treatment options for the waste. A request for best and final offers on these proposals is currently being prepared.

Competition for this scope motivated vendors to provide pricing and prepare a plan to resolve technical issues that were preventing the vendors from treating the waste.

CONCLUSIONS

The DOE complex generates waste that can be very difficult to treat and dispose. While treatment and disposal capability is readily available to manage the majority of wastes that are generated, waste management personnel must study problematic waste carefully in order to match the waste with treatment and disposal technologies within the boundaries of the regulations and other limitations. Even though the path to disposal may not be easy or readily apparent, through detailed investigation, the code can be broken on challenging wastes.

Wastes can be challenging to treat and dispose due to many different factors, but a few of the most common issues are:

- Odd combinations of regulatory requirements or other constraints
- Classified waste
- Dioxin and furan waste (dioxin and furan codes or UHCs)
- Reactive waste
- Certain contaminants combined with PCB

In order to break the code on challenging waste, waste management personnel need to learn everything possible about their problematic waste. Thorough knowledge of the waste, the capabilities of treatment and disposal vendors, and the regulations are all necessary to find options for challenging waste. Organizations trying to break the code on challenging waste need to focus on the following factors:

- Detailed understanding of process knowledge associated with the waste
- Careful review of all characterization data to ensure that the data accurately represents the waste
- Thorough review and validation of the regulatory status of the waste and associated requirements for treatment and disposal of the waste
- Fully utilize the capabilities, expertise, and experience of treatment and disposal vendors
- Allow competition to work to your advantage technically as well as financially