THE PROPOSED COMBUSTION STANDARDS AND DOE THERMAL TREATMENT SYSTEMS *


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ABSTRACT

Under the provisions of the Clean Air Act (CAA) concerning emission of hazardous air pollutants (HAPs), the Environmental Protection Agency (EPA) published the proposed Revised Standards for Hazardous Waste Combustors on April 19, 1996 (EPA, 1996). These standards would apply to the existing Department of Energy (DOE) radioactive and mixed waste incinerators, and may be applied to several developing alternatives to incineration. The DOE has reviewed the basis for these regulations and prepared extensive comments to present concerns about the bases and implications of the standards. DOE is now discussing compliance options with the EPA for regulation of radioactive and mixed waste thermal treatment systems.

DOE THERMAL TREATMENT SYSTEM ISSUES

The system configuration issues that differentiate the DOE thermal systems include:

- DOE incinerable waste includes legacy mixed waste (mixed waste contains both radioactive and hazardous contaminants) that are difficult to characterize for treatment and were predominantly generated before the current hazardous waste regulations were developed.

- DOE's mixed waste volumes are relatively small, and DOE incinerators are subsequently small units, generally batch fed.

- Mixed waste incinerators generally include air pollution control devices (APCD) to control radioactive particulate emissions. The resultant high removal efficiencies for particulate matter exceed those of typical commercial incinerator systems.

- DOE mixed waste treatment plans have been negotiated with the involved states and formalized in Site Treatment Plans and consent agreements which impose schedules for treatment of waste.

Features of the proposed rule that fail to recognize DOE's mixed waste incinerator issues include:
It was judged that there is no basis for separate regulation of small incinerators. Since DOE's mixed waste systems are small systems located on large remote sites, this is particularly restrictive when viewed from a risk viewpoint.

DOE expects a very limited set of facilities subject to this rule including three existing incinerators and potentially a half dozen other installations. Even though the effect of the rule is limited, it is very important to DOE because there are no available alternatives.

The proposed rule imposes limitations on automatic waste feed cutoffs at 10 per 60 days. DOE's small thermal treatment systems experience automatic waste feed cutoffs due to the batch feed mode and their small size. These automatic cutoffs serve their intended purpose in avoiding outleakage of radioactive/hazardous contaminants and assuring good destruction conditions. Limitation of the number of cutoffs (particularly those that do not result from system malfunction) may limit the DOE's ability to keep the systems running and jeopardize compliance schedules.

The proposed rule assumes that mercury can be segregated from the feed and establishes the emission limits on that basis. The mercury contamination is co-mingled with the waste matrix and not readily separated. Even assuming the mercury could be segregated, current treatment requirements require a mercury retort treatment which would be permitted in a manner similar to an incinerator.

The proposed rule assumes that lead can be segregated from the feed and establishes the limits accordingly. DOE's wastes have much many forms of lead co-mingled with the waste.

Regulatory compliance for mixed low level waste requires treatment to address the hazardous aspects of the waste. The remainder of this paper examines proposed rules for hazardous waste incineration, issues impacting mixed low level waste treatment, and DOE's proposed resolution of those issues.

SUMMARY OF PROPOSED STANDARDS FOR HAZARDOUS WASTE INCINERATORS

Under the Clean Air Act (CAA) Amendments of 1990, EPA is directed to establish maximum achievable control technology (MACT) for all new and existing major sources of hazardous air pollutants (HAP) emissions. A major source is defined as a stationary source that emits, or has the potential to emit considering controls, 10 tons per year of a HAP or 25 tons per year of a combination of HAPs. As a result, all incinerators are regarded as major sources. An area source is generally a stationary source that is not a major source. EPA published an initial list of 174 categories of such major and area sources in July of 1992.

Hazardous waste incinerators is one of the 174 categories of sources listed. The listing was based on EPA's determination that at least one hazardous waste incinerator may reasonably be anticipated to emit several of the 189 listed HAPs in quantities sufficient to designate them as major sources. On April 19, 1996, EPA issued a proposed rule entitled "Revised Standards for Hazardous Waste Combustors" that proposes to regulate HAP emissions from hazardous waste incinerators based on MACT (EPA, 1996). These rules are intended to apply to new units constructed after the date of the proposed rule and to
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existing units within three years of finalization of the rule. Note that the proposed rules are published under joint authority of the CAA and the Resource Conservation and Recovery Act (RCRA).

The proposed rules would set the following emission limits and monitoring requirements: (Note that all emission limits are corrected to a 7% O\(_2\) combustion gas.)

- **Dioxins and furans** have a limit for existing and new sources of 0.20 nanograms/dry standard cubic meter (ng/dscm). After successful completion of a performance test that demonstrates dioxin/furan compliance, all subsequent operation of the system must be within the operating limits established in that test.

- **Mercury limits** for existing and new sources must not exceed 50 micrograms/dscm (10 hour rolling average). Continuous Emission Monitors (CEMs) will be used unless it can be established that the maximum feed rate of mercury could not result in exceeding the emission standard.

- For existing sources, the emission limit of the semivolatile metals, lead and cadmium, is 270 micrograms/dscm, (12 hour rolling average if CEMs are used). The limit for new sources is 62 micrograms/dscm (10 hour rolling average). Monitoring requirements are based on the use of CEMs for multi-metals. If a CEM is not used, then limits are set for particulate matter, maximum feed rate for semivolatile metals, maximum total chlorine and chloride, and minimum gas flow rate.

- For existing sources the combined emissions of low volatility metals; arsenic, beryllium, chromium, and antimony, are set at 210 micrograms/dscm (10 hour rolling average if CEMs are used). New source limits are set at 60 micrograms/dscm or 80 micrograms/dscm (if CEMs are used) over a 10 hour rolling average. If a CEM is not used, then limits are set for particulate matter, maximum feed rate for low volatility metals, maximum total chlorine and chloride, and minimum gas flow rate.

- **Carbon monoxide limits** for existing and new source limits are set at 100 ppm (parts per million dry basis) on a one hour rolling average. CEMs are to be used for monitoring.

- **Existing and new source limits for hydrocarbons** are 12 ppm (dry basis on a one hour rolling average, and reported as propane). CEMs are to be used for monitoring.

- **Combined acid gas and chlorine** (expressed as HCl equivalents) are limited to 280 ppm (dry basis one hour rolling average, if CEMs are used). New source limits are set at 67 ppm (dry basis on a one hour rolling hour average, if CEMs are used). Monitoring limits impose use of CEMS. If CEMS are not used, limits are set for chlorine/chloride feed rate and maximum flue gas flow rate. Operating limits on control technologies used are also set if CEMs are not used.

- **Particulate matter limits** for existing and new sources are 69 mg/dscm (two hour rolling average). CEMs are to be used for monitoring.
These proposed rules were established according to the CAA requirement that MACT standards must be at least as stringent as the minimum level of control specified in CAA Section 112(d)(3), often called the "MACT floor." In determining the MACT floor, EPA must look at the level of control currently achieved by existing sources in a given source category. For existing sources, the MACT floor must be no less stringent than the emission control achieved by the best performing 12 percent of sources in that category (or the top 5 performers where fewer than 30 sources exist within a category.) For new sources, the MACT floor is more stringent; it is set by the single, best-performing source in the category.

EPA can decide to select a control strategy more stringent than the MACT floor for both existing and new sources. Standards that are more stringent than the floor are called "beyond the floor" (BTF) standards. EPA can set BTF standards, but they have to consider criteria such as cost-effectiveness, energy, technologies currently in use within these industry sectors, other technologies that have been demonstrated and are available on the market, health benefits, and non-air environmental implications.

It should be noted that the MACT floor may be based upon more than controls of stack emissions. In situations where the best performing sources rely on feed stream limits as well as controls, both are considered in setting the floor. These feed stream limits are converted to a Maximum Theoretical Emission Concentration (MTEC) and are part of the MACT floor for mercury, semi-volatile metals, and low volatile metals.

RESPONSE TO PROPOSED RULES FOR HAZARDOUS WASTE INCINERATORS

Comments on the proposed rules were due August 19, 1996. Although the rules were scheduled to be finalized in late 1996, the rules are now projected to be finalized in March 1998 due to the volume of comments received.

The Department of Energy provided a 170 page comment package on the proposed rules. The DOE comments represented the consolidated input of DOE field offices and technical programs involved with thermal treatment of waste. A major theme of these comments was the unique nature of mixed waste thermal treatment at facilities owned and/or operated by the federal government. DOE generated mixed waste in carrying out its research and production mission in over 40 sites in 21 states. Most of DOE's mixed waste is located at the Savannah River Site (SRS) in South Carolina, the Idaho National Engineering and Environmental Laboratory (INEEL), the Oak Ridge National Laboratory (ORNL) in Tennessee, the Hanford Reservation in Washington, Rocky Flats in Colorado, and the Nevada Test Site. Currently, estimates from the Mixed Waste Inventory Report (prepared as a requirement of the Federal Facility Compliance Act) for DOE mixed wastes in storage and projected generations show approximately 25,000 tons per year of incinerable mixed waste at DOE sites. By comparison, EPA's combustion strategy estimates that 3.5 million tons of hazardous wastes are combusted annually. Mixed waste comprises approximately .7% of all wastes combusted annually.

Issues related to competing regulatory requirements

DOE is currently managing its mixed waste under Site Treatment Plans approved by individual states (or, in some cases, EPA) in fulfillment of the requirements of the Federal Facility Compliance Act of 1992 (FFCA). Under these Site Treatment Plans (STP), DOE sites have signed legally binding consent agreements committing to schedules for treatment of mixed waste in existing facilities and development of
additional capacity for treatment of mixed waste. DOE is currently operating two mixed waste incinerators at the INEEL and ORNL, with another facility due to become operational shortly at SRS. A number of new DOE mixed waste thermal treatment facilities are in the planning stage at INEEL, SRS, ORNL and the Hanford site. These existing and planned DOE mixed waste thermal treatment facilities are a key part of Site Treatment Plan compliance and implementation. Resolution of how these proposed rules will apply to mixed waste thermal treatment systems will be needed to allow DOE to move forward in compliance with the Site Treatment Plans.

DOE points out that three years for compliance does not allow a federal agency subject to the federal budget cycle to respond, as the budget cycle takes three years. DOE is concerned that significant redesign and re-engineering of mixed waste thermal treatment systems may be required for compliance, and the federal budget cycle does not allow initiation of capital expenditures until the third budget year. Expeditious response by DOE could easily take 5 to 6 years. If the three years compliance schedule is applied, it is likely that some units will be unavailable to meet legally binding compliance agreements that dictate waste treatment schedules. DOE will then be in violation of these agreements.

DOE also requests clarification of the RCWCAA relationship for permitting of incinerators and reporting requirements. As written, DOE will be required to make dual reports and dual record keeping systems to comply with slightly different needs of the regulations. DOE asks for consolidation of these requirements.

DOE is concerned that regional administrators can apply both MACT standards and RCRA risk assessment requirements. This again increases compliance costs and complexities.

DOE also requested a revision of the "new source" definition to avoid categorization of the Savannah River CIF incinerator, currently in startup, as a new unit. If considered a new unit, the incinerator may have to redesign some systems and will be unavailable to meet compliance schedules. DOE is also concerned that because the rule is promulgated under CAA, the rule became effective on the date of proposal for new facilities. This could lead to significant implementation problems, especially in light of the changes that EPA is indicating may be made in the proposed rule.

Issues with metals emission standards

The MACT standard for mercury was established assuming feed control in conjunction with a wet scrubber system for emission control. Data in the mercury data set (Shown on Table 3-6 in Volume 3 of the Technical Support Document) that represented high input of mercury (high MTEC) was disqualified from the MACT pool. This disqualified 14 of the available 59 data points. The disqualified data points are those representative of likely feed to mixed waste incinerators. Feed control on legacy drummed and boxed waste would involve manual opening, sampling and sorting each waste package. This activity would result in significant manpower radiation exposure and cost. The increased exposure is in violation of the DOE policy of keeping exposure As Low As Reasonably Achievable (ALARA). Therefore, the feed control assumption of this MACT standard is not valid for mixed waste thermal treatment systems.

Similarly, the standard for semi-volatile metals (SVM) was established assuming that feed control can be used. In fact, all data in the data set (Table 3-9 of Volume 3 of the Technical Support Document) that represented high input of SVM was disqualified from the MACT pool. Twenty four data points, the ones
most representative of the DOE situation, were disqualified from the MACT pool for this standard. Requiring feed control for semivolatile metals has the same negative features as imposed by mercury control.

Since the bases for the metals emission MACT floor is inappropriate to the DOE waste operations, DOE requests establishment of a separate category for radioactive and mixed waste incinerators. The metals emission standards for this category would be based on discussions with the EPA to address expected emissions, monitoring limitations, and risk to the public health and environment.

Issues related to small waste treatment volumes and systems

DOE radioactive and mixed waste thermal treatment systems are generally small units located on large remote sites owned by DOE. Mixed waste units under development are smaller units based on melter technology instead of a standard incineration technology. One unit currently being constructed at the INEEL for the Pit 9 clean up has a gas flow rate of 0.5 dscm/s, much smaller than the flow rate from even a small incinerator. A small gas flow rate results in a very small allowable feed rate in order to achieve the calculated MTEC, if that becomes the limitation. Thus, as applied to small units, the required waste feed limit may be very difficult to achieve or to detect. Therefore, DOE asks EPA to consider a separate category for small mixed waste thermal treatment systems.

EPA's consideration for small incinerators limits them to on-site wastes. DOE requested that the agency not limit small incinerators to on-site wastes as that limits their ability to treat mixed waste from the smallest DOE generators at the consolidated thermal treatment sites. DOE has mixed waste available for incineration at over 40 sites. In the current DOE budget environment it is not possible or fiscally responsible to assume separate thermal treatment systems in each of the 40 sites. In addition, DOE asks that EPA consider that the mixed waste incinerators are not "major sources" and define "trivial aggregate emissions" that could exempt small units from permitting.

Systems to treat mixed waste are engineered to address concerns with radiological exposure to workers and the environment and are not practical to use as dual purpose facilities for combustion of hazardous waste. Processing hazardous waste in a radioactive waste unit would create mixed or radioactive waste, which is against DOE policy. Most mixed waste combustion units will be relatively small. Input feed will typically be 200 to 2,000 lb/hour. Since the installation of larger units is unlikely, EPA should re-consider whether the overall rationale for setting design based requirements should be applied to mixed waste treatment systems. EPA should consider setting mass based or alternatively risk-based emission limits for mixed waste combustors taking the above factors into consideration. In addition, EPA should consider the requirements already applicable through the National Emission Standard For Hazardous Air Pollutants (NESHAPs) for radionuclide emissions from DOE facilities. For mixed waste combustion units, the monitoring required under the NESHAPs should be reviewed and to the extent this monitoring could satisfy other concerns, it should be used.

The requirements in the proposed rule regarding Automatic Waste Feed Cut Off (AWFCO) are also problematic for small mixed waste incinerators and thermal treatment systems. DOE conservatively sets pressure and composition limits in these units to contain all radioactive materials and ensure good destruction. As batch fed systems, oxygen concentration and system pressures fluctuate during normal operation. The automatic waste feed cutoff systems function as designed to avoid feeding the systems
when system parameters are not correct. Imposition of a limit of 10 AWFCOs per 60 days will require either redesign on the systems to continuous feed or repackaging of waste in smaller packages with homogenized contents. The required feed shredders and conveyors and manual sorting operations are likely to increase risk to operating personnel. DOE requests deletion of the limitation on AWFCOs for mixed waste units. As an alternative to addressing the number of AWFCOs which trigger a report, EPA could consider ways to establish what triggers an AWFCO and how it would be measured. One suggestion is that EPA provides one (1) or two (2) seconds to compensate. Alternatively, recognition of the benefit of the incinerator confinement building could ease the requirement. EPA could also address the issue by allowing greater permit flexibility.

Issues with particulate emission standards

DOE’s radioactive and mixed waste incinerators include very high efficiency particulate removal systems. All but one DOE incinerators have High Efficiency Particulate Air (HEPA) filters which remove 99.97\% of all particles larger than 0.3 microns. These systems result in very low particulate emission levels, which also reduces levels of SVM and dioxin/furans.

Since the DOE incinerators emit very low particulate emissions, and these emissions are far below the requirements, DOE requests an alternative standard to one based on performance test data. Use of a PM monitor with shutdown limits based on performance data will lead to shutdowns from the AWFCO, even though the emissions are well within regulatory limits. The DOE particulate emissions are so low particulate and semivolatile metal CEMS may be unnecessary. This issue is one that DOE would like to discuss with the EPA, as the MACT methodology is likely to lead to extremely low MACT floor levels for PM and metals using the existing small set of mixed and radioactive waste incinerators as a basis.

The proposed rules suggest carbon injection systems or carbon bed absorption for control of dioxins/furans and mercury. Such control strategies increase the amount of secondary mixed waste which is generated, which subsequently must undergo treatment. This increases the costs for operation of mixed waste treatment units, an issue which was not provided to the Office of Management and budget for consideration nor evaluated in determining to us Beyond the Floor standards for certain pollutants. In addition, the carbon injection is likely to increase the particulate loading on the HEPA filters, and the associated cost of disposal and replacement.

ACTIVITIES RELATED TO ISSUE RESOLUTION

DOE and EPA are meeting to discuss these issues and determine whether justification can be achieved for different regulation of mixed waste. It is anticipated that work on this issue as well as work on other aspects of the rule will continue during 1997.

DOE and EPA will also continue to cooperate on CEM development and testing to determine CEM capabilities and availability. The proposed performance specifications for CEM may change based upon additional testing. In addition, EPA is evaluating whether a certification program for CEMs should be implemented.

CONCLUSION
DOE's mixed waste thermal treatment systems do not meet the conditions used in the development of the MACT rules. DOE does not believe that imposition of the proposed combustion rules on mixed waste incinerators will provide an overall benefit to environmental health and welfare, and therefore recommends that EPA consider radioactive and mixed waste incinerators to be a separate category with separate design and emission standards. Discussions should take place to determine if data from existing mixed waste systems should be used to set the MACT standards or alternate standards could be considered for this new category. This approach would not likely result in higher MACT emission limits because of the high efficiency air pollution control devices used to control radionuclide emissions. Monitoring requirements may also be different for mixed waste units, particularly for those pollutants such as LVM and SVM for which CEMs are not currently available. In instances where CEMs are required, EPA should clarify that feed stream analysis will not be required for constituents covered by CEMs and that CEMs substitute for feed stream analysis.

REFERENCES