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United States Environmental Protection Agency
Washington, D.C. 20460
Office of Solid Waste and Emergency Response

September 22, 1992

MEMORANDUM

SUBJECT: Assuring Protective Operation of Incinerators Burning Dioxin-listed Wastes

FROM: Sylvia K. Lowrance, Director
Office of Solid Waste

TO: Waste Management Division Directors
Regions I - X

I would like to call your attention to, and provide guidance on, an issue which was brought to our attention recently related to incineration of wastes containing low levels of dioxins. A recent case, and review of incinerator data in general, indicates that a well-operated incinerator meeting the regulatory Destruction and Removal Efficiency (DRE) on a harder-to-burn surrogate compound may have difficulty in achieving high DREs on dioxin itself due to the low levels at which the dioxin is normally present. Although we believe a well-operated incinerator is capable of destroying dioxin to below risk-based levels, we are recommending site-specific testing and risk assessment to confirm protectiveness at individual sites in view of the level of concern over dioxin.

We believe this issue may arise at other sites where it is proposed to burn dioxin-listed wastes. The following is a discussion of the technical aspects of this finding, our interpretation of the RCRA regulations as they relate to this issue, and our recommendations on how this issue should be addressed if encountered.

Technical Background

The low dioxin DRE in this recent case was consistent with our current body of incinerator performance data, which show a very clear trend of decreasing DRE for hazardous constituents with

decreasing incoming concentration of the constituents in the waste feed. (That is, the lower the constituent concentration in the waste, the lower the DRE.) The data show that a properly operating incinerator, which reached 99.99% DRE (four nines) on higher concentrations of POHCs, will often achieve less than four nines when the concentration of a POHC (principal organic hazardous constituent) in the waste is less than 1,000 ppm. At this time, we have not determined a definitive scientific explanation for this phenomenon. There appears to be some small level of constituents that remain in the emissions even from well-operated incinerators, possibly due to reformation of these compounds as products of incomplete combustion (PICs). It should be noted, however, that even though the measured DRE decreases at lower POHC concentrations, emission rates of, and thus the risks associated with, these compounds stay relatively constant or decrease at trace levels.

Regulatory Interpretation

The regulations at 40 CFR 264.343(a)(2) require that an incinerator burning hazardous wastes F020, F021, F022, F023, F026, or F027 achieve a DRE of 99.9999% (six nines) for each POHC in its permit, and that this performance be demonstrated in a trial burn on POHCs that are more difficult to incinerate than specified dioxins and furans. The regulations do not specifically set a DRE standard for dioxins and furans themselves. Thus, an incinerator which demonstrates six nines DRE on harder-to-burn POHCs complies with the DRE performance standard applicable to dioxin-listed wastes, even if six nines not actually achieved on low levels of dioxin present in the waste. Dioxin itself is not likely to be chosen as a POHC because it would normally not be present in the waste at high enough levels to assure sound sampling and analysis, and an accurate six nines DRE calculation.

To assure detection of POHC compounds in the stack to enable the DRE calculation to be performed, and to override any effects of PIC formation on calculated DREs, POHCs are normally spiked into the trial burn waste at high concentrations. We believe that this approach is a sound way of assuring a good test of POHC destruction and removal, which in turn assures that an incinerator is operating at an optimum level of performance. (We believe that PICs should be addressed directly, separate from DRE, as explained below.) However, spiking of dioxin itself to higher levels is not desirable due to its toxicity.

Estimates of risk to public health resulting from PICs based on available emissions data indicate that these emissions do not pose significant risks when incinerators are operated at optimum conditions. Nonetheless, to ensure that emissions of total residual organic compounds, that is, trace levels of unburned organic compounds in the waste plus organic compounds generated during combustion as PICs, do not pose a significant risk, we recommend following the relevant portions of the PIC approach presented in the Boiler and Industrial Furnace (BIF) Rule (56 FR 7134, February 21, 1991), and, when updated, the guidance on addressing PIC emissions from incinerators. This approach involves setting a maximum carbon monoxide or hydrocarbon level to assure that overall PIC emissions are low. The BIF approach also requires testing for dioxin and furan emissions and performing a risk assessment at facilities operating under specific conditions considered to be conducive to production of dioxins and furans as PICs, to be sure these compounds are not present at levels of concern.

Recommended Approach for Dioxin-listed Wastes

Risk Assessment:

Given the public concern over dioxin-listed wastes, we believe that it is necessary to perform a site-specific risk assessment as an additional check at facilities proposing to burn such wastes, to demonstrate that the DRE and PIC controls will control emissions of chlorinated dioxins and furans to levels that will not pose a hazard to human health and the environment. The preamble to the January 14, 1985 (50 FR 1978), promulgation of the management standards for dioxin-containing wastes F020, F021, F022, F023, F026, and F027 discusses risk assessments performed over a range of incinerator sizes, dioxin concentrations, and DREs, and appears to indicate that the risk assessments supporting the final dioxin incineration standards assumed six nines as the DRE for dioxin. Since the concentration of dioxins in dioxin-listed wastes is normally very low, the data indicating lower DREs at low concentrations lends uncertainty to the six nines assumption.

For this reason, the risk assessment calculations performed in the course of the dioxin rulemaking may not be representative in some cases. Thus, we believe that it is appropriate to perform site-specific risk assessments for incinerators proposing to burn such wastes with low levels of dioxins, to demonstrate that the

performance standards are protective of human health and the environment. Such a site-specific risk assessment should use actual chlorinated dioxin and furan emissions data obtained while the incinerator is burning the low-concentration dioxin wastes.

Testing:

We also believe that in most cases where a facility is applying to burn dioxin-listed wastes, the incinerator should be tes.ted on non-dioxin wastes first to demonstrate six nines DRE on harder-to-burn POHCs prior to testing it on actual dioxin-listed wastes, to assure that the incinerator is operating at optimum performance before dioxin is burned. One situation where burning dioxin-listed wastes may not, in itself, warrant this approach would be where the dioxin concentrations in the waste are so low that, even assuming zero DRE, the stack gas concentrations of dioxin would be nondetectable. In such a situation, the need for dioxin testing would be determined on the basis of whether it is likely to be formed as a PIC. until the PIC guidance is updated, the BIF rule and the Office of Solid Waste can be consulted for assistance in making this determination. Such testing, if needed, could be done simultaneously with the DRE testing.

To implement the recommended testing approach for a commercial incinerator applying to burn dioxin-listed wastes, dioxin wastes need not be "imported" prior to permitting the incinerator. The trial burn for the incinerator could be used to demonstrate six nines DRE on POHCs more difficult to burn than dioxin. If successful, these data could be used as a basis for the permit. The permit would require that the facility notify the permit authority and test for dioxin emissions when it burns its first shipment of dioxin-listed wastes.

Design and operation:

We would also like to emphasize the importance of assuring that incinerators burning dioxin wastes are designed and operated in a manner to maximize DRE of dioxin and minimize its formation as a PIC. For example, studies on municipal waste combustors have identified a temperature range for particulate matter control devices that is associated with the potential for elevated levels of chlorinated dibenzodioxins and dibenzofurans. The BIF preamble at 56 FR 7162-4 (February 21, 1991) provides a discussion of this issue. We recommend that this factor be taken into account in

reviewing or developing specifications for incinerator designs and test plans.

In closing, we would like to note that we believe that well-operated incinerators are capable of meeting the performance standards and destroying dioxin to below risk-based levels. Further, none of our data from hazardous waste combustion devices shows dioxin formed as a PIC at levels of concern. However, given the degree of concern over dioxin, we believe a site specific evaluation is warranted to demonstrate protective operations at individual sites where dioxin wastes are to be burned.

We discussed this issue with the Waste Combustion Permit Writers' Workgroup during its February, 1992, meeting and on the April, 1992, conference call. We will continue to evaluate data related to this issue and will keep the Workgroup, including OERR contacts, informed. If you need additional guidance on how to address this issue at an individual site, feel free to contact Sonya Sasseville of my staff at (202) 260-3132.

cc: Henry Longest; Bruce Diamond; Waste Combustion Permit Writers' Workgroup

bcc: Dev Barnes; Matt Hale; Denise Keehner; Jim Michael; Matt Straus; Gary Clifford; Joanne Griffith; Debbie Dietrich