PDR

KERR-McGEE
KERR-McGEE CENTER • OKLAHOMA CITY, OKLAHOMA 73125

December 5, 1980

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. William A. Nixon
Uranium Fuel Licensing Branch
US Nuclear Regulatory Commission
Washington, D. C. 20555

RE: Docket No. 40-2061

Dear Mr. Nixon:

Please refer to our amendment application dated May 28, 1980 in which we describe the intended use of an incinerator at the Kerr-McGee Chemical Corporation Facility in West Chicago, Illinois.

We now submit additional information in response to questions listed on your document entitled, "Information Required for Commission Approval of Treatment of Disposal By Incineration", as revised October 3, 1979.

We believe this new information coupled with that of May 28, 1980 will adequately meet your needs to permit prompt approval of our application.

Sincerely,

W. J. Shelley, Vice-President
Nuclear Licensing and Regulation
Environment and Health Management

WJS/pls

Enclosure

cc: Louis Saguinsin

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REPLIES TO QUESTIONS ON AN NRC DOCUMENT TITLED,
"INFORMATION REQUIRED FOR COMMISSION APPROVAL OF TREATMENT OR DISPOSAL BY INCINERATION", Revised October 3, 1979,
and a Dose Evaluation.

1. Question: State specifically the isotopes you wish to incinerate. For each isotope listed, you should submit calculations demonstrating that air concentrations of the effluents at the stack are in accordance with the requirements of Section 20.106 of 10 CFR Part 20.

Reply: Tailings and chemical residues may contain Thorium and lesser amounts of Uranium. Most combustible trash and building materials which are contaminated have not been contacted by the tailings or residues. Most of the combustible material became contaminated from contact with the more purified Thorium intermediate or finished products. Although traces of Uranium may be found in the contamination, it is natural Thorium and its daughters adhering to wood and other combustible items which are the radioactive isotopes of concern during the incineration process. This surface contamination is invisible to the eye, on the average, and typically amounts to 6.71×10^{-5} μ Ci/cm^3 (1.9 μCi/ft.^{3}) of natural Thorium in the trash. (The 1.9 μCi/ft^3 value is an average from measurements made on 190 cubic feet of typical combustible trash located at the K-M West Chicago facility).

We define natural Thorium here as equal activities of Th-232 and Tn-228. Since there are the equivalent of four more alpha emitting isotopes in the Thorium series, it is appropriate to use an alpha curie content three times larger than for natural Thorium, assuming all thoron daughters remain with the surface contamination. This conservative approach facilitates the use of dose conversion factors from NUREG-0172 later in this discussion for Th-232+D.

$$(1.9\ \mu Ci/ft.^3)(3) = 5.7\ \mu Ci/ft.^3 \text{ for Th-232+D.}$$

The bulk density of the material incinerated will approximate that of wood (~35 lbs/ft.^{3}) since wood will comprise most of the trash. Using the rated capacity of the incinerator of 1,000 pounds per hour and and annual use time of 4,000 hours, approximately 0.652 Ci of Thorium could be incinerated per year.

$$\frac{(5.7\,\mu\text{Ci/ft.}^3)(1{,}000\ \text{lbs./hr.})(4{,}000\ \text{hrs./yr.})}{(35\ \text{lbs./ft.}^3)(10^6)\,\mu\text{Ci/Ci})} = 0.652\ \text{Ci/year}$$

Test data supplied by the incinerator manufacturer shows 0.015% of the quantity incinerated is entrained as particulate matter in the flue gas leaving the incinerator. This gas then passes through a baghouse (99.5% collection efficient) and HEPA filters (99.97% efficient to 0.3 micrometer DOP particles). The quantity of particles of concern which escapes filtration is approximately 1.47×10^{-10} Ci/year.

$$(0.652\ \text{Ci/year})(0.00015)(0.005)(0.0003) = 1.467 \times 10^{-10}\ \text{Ci/year}.$$

The typical flow rate of~4,000 ACFM will yield an average annual operating discharge stack effluent concentration of $2.46 \times 10^{-18}\,\mu$ Ci/cm^3.

$$\frac{(10^6\,\mu\text{Ci/Ci})\ (1.47 \times 10^{-10}\ \text{Ci/year})}{(4{,}000\ \text{ft}^3\text{/min})(28{,}317\ \text{cm}^3)(525{,}600\ \text{min/yr})} = 2.46 \times 10^{-18}\,\mu\text{Ci/cm}^3$$

An adult breathing air having a concentration of $2.5 \times 10^{-18}\,\mu$ Ci/cm^3 of the Th-232 plus its daughters for a year will have an inhalation of:

$$(8{,}000\ \text{m}^3\text{/yr})(10^6\ \text{cm}^3\text{/m}^3)(2.5 \times 10^{-18}\,\mu\text{Ci/cm}^3)(10^6\ \text{pCi/}\mu\text{Ci}) = 2 \times 10^{-2}\ \text{pCi}$$

The resulting cumulative dose equivalent for an exposure of 2×10^{-2} pCi/year is shown in the following table. This table is constructed from data found in NUREG-0172.

Millirem per 2 x 10^{-2} pCi from Thorium 232 and its Daughters Inhaled in the First Year

Bone	Liver	Total Body	Kidney	Lung	GI(LLI)
5.12E-02	2.24E-03	1.81E-03	1.09E-02	1.19E-02	6.34E-07

The above dose assessment is a worse case condition since no dilution factor is used to account for the difference in concentration of the stack and at the closest residence. The final effluent discharge stack will be at least 30 feet tall. Meteorological conditions contribute to significant dispersion of the exhaust plume as it moves away from the stack. Wind direction is also a factor which affects individual exposures at various locations. The residence closest to the incinerator is about 75 meters to the east. Westerly winds impact this area about 10% of the time. There are no air intake ducts of concern in close proximity to the incinerator stack.

The above discussion also answers several other questions included in the October 3, 1979 NRC document. These questions are Nos. 2,3,4, and 9 as follows:

2. Submit the characteristics of the incinerator such as height of the stack, height and distance to buildings in the surrounding areas, rated airflows of the incinerator in cubic feet per hour or similar units, and its proximity to any air intake ducts.

3. The gaseous effluent from the incinerator stack should not exceed the limits specified for air in Appendix B, Table II, 10 CFR Part 20, when averaged over a twenty-four (24) hour period.

4. In order to be in compliance with the ALARA philosophy stated in Section 20.1(c) of 10 CFR Part 20, the gaseous effluent from the incinerator stack should be a fraction (approximately 10 percent) of the limits specified for air in Appendix B, Table II, 10 CFR Part 20, when averaged over a one-year period.

9. State the maximum number of burns to be performed in any one week and the maximum number of burns per year.

Answers to questions Nos. 5,6,7, and 8 will complete the NRC list. These follow:

5. Describe the method of measurement or estimation of the concentration of radioactive material appearing in ash residue.

The average concentration of natural Thorium in the trash is 1.9 alpha μCi/ft.^{3}. Assuming a 90 percent volume reduction by incineration, the ash would contain 19 μCi/ft.^{3} of ThO_2. Assuming daughter equilibrium, the alpha content of the ash will be 57 μCi/ft.^{3}.

A 50 ml, sample of ash will be collected each day the incinerator is used and a composite sample will be prepared for chemical analysis of its Thorium and Uranium content. Initially, a one-liter or larger sample of ash will be taken for analysis after the first days' use of the equipment. Once the incinerator use becomes routine, the composited sample will probably only need to contain a one-month collection of ash before analysis.

6. Describe the procedures for handling and disposing of ash from the incinerator.

The incinerator is to be located inside a building to shield it from wind and inclement weather. The baghouse and final filter system are located outside of the building. As described in our May 28, 1980 application, the incinerator ash is removed from the ash chamber after it is cooled and dampened with a water spray. The damp ash is shoveled from the cleanout and placed into a poly bag lined steel drum (55-gallon drum). (A shovel full of commercial absorbant is placed into the drum liner before the damp ash is added.) After nearly filling the drum with damp ash, it is allowed to stand for several hours, loosely covered, and then inspected for free-standing water. Free-standing water is

absorbed by adding twice the absorbent required. The drum liner is sealed (or tied off) and the drum lids secured on the drums. The drums are marked "Trash Ash", "LSA" and the month and year. The drums are then stored for ultimate disposal.

The baghouse receiver may contain as much as twelve pounds of ash after a week's use. The ash receiver is promptly covered when it is removed from the baghouse. It is brought into the incinerator building where its contents are carefully wet with a water spray before the ash is transferred to a drum.

Wet ash spills which fall on the incinerator building floor are promptly picked up using shovels, damp mops, etc. Work area air samples are taken in the building at all times the incinerator is operating. Frequent surface contamination surveys are also made. Removable alpha contamination on floor surfaces exceeding 2,000 dpm/100 cm^2 will require corrective action to reduce the contamination level.

7. Describe procedures to be followed to prevent overexposure of personnel during all phases of the operation, including instruction given to personnel handling the combustibles and the ash.

Most of these procedures are already described. In additon, personnel performing the tasks described here and in our application of May 28, 1980, will be made thoroughly aware of the contents of these applications and of the techniques required to prevent personnel overexposures and releases of radioactivity to unrestricted areas. They shall have attended classroom and "hands-on" training sessions covering (1) basic understanding of radiation and its hazards, (2) radiation detection instruments, (3) personnel dosimetry and monitoring, (4) protective clothing, (5) respiratory protection, (6) decontamination techniques, (7) contamination control techniques, and (8) administrative control procedures.

8. Submit evidence that all State and local regulations concerning incineration of radioactive material have been met by your institution.

A. State of Illinois

The State of Illinois Air Pollution Control Regulations define the particulate emission standards and limitations for incinerators. Particulate emissions for new incinerators may not exceed 0.1 grains per standard cubic foot of effluent gases. Section D, 106 of the Illinois Department of Public Health regulations states that a licensee shall not use any licensed material in a way so as to release to an unrestricted area radioactive material in concentration which exceed the limits specified in Appendix A, Table II. This Table is similar to that found in Title 10 CFR20 Appendix B, Table II, excepting the Illinois concentration limits values for Uranium and Thorium are based on the obsolete "double curie" and are one-half the values given in 10 CFR20.

Regardless of the differences in the rules, the Kerr-McGee incinerator effluents will easily meet all of the applicable limiting values.

B. City of West Chicago

The air quality standards of the City of West Chicago Pollution Control Ordinance (Ord. No. 1068, 1.1, 11-2-70) are found in Section 14-15 of these regulations. These rules do not specifically address the incineration of radioactive materials. Section 14-15 does include opacity limits (Ringelmann No.1) and a particulate limit of 0.10 grains per cubic foot. It also includes prohibitions for toxic airborne matter, odors and nuisances insofar as they might be harmful or an annoyance.

The Kerr-McGee incinerator stack effluent will have a visible water vapor plume, meeting the Ringelmann 1 requirements. This effluent has a design (tested)concentration of 0.1 grain/scf without filtration. The incinerator should seldom (if ever) emit offensive odors and its use will be of far greater benefit to all concerned.

The Almega Corporation

SUMMARY OF EMISSION TEST DATA

TABLE: 1

PLANT: Federal Incinerators, Inc.

LOCATION: Stack, Federal Incinerator Model FPC-W-4BF

OPERATOR: Eric Aynsley Ph. D.

REPETITION #:	1	2	3
TEST DATE: November 9, 1978			
STACK GAS			
Temperature, average ^{o}F	1342	1474	1548
Velocity average fps	30.37	30.72	31.68
Volume flow x 10^{6} scf db	0.09684	0.08994	0.0904
Volume flow acfm	6212	6283	6480
Moisture %	11.78	13.03	11.91
Orsat Analyses %			
Average grab samples: CO_2-O_2	8.52 - 10.0	8.28 - 10.1	7.725 -10.
Integrated sample: CO_2-O_2	8.2 - 10.9	8.0 - 10.9	8.1 -10.
PARTICULATE SAMPLE			
Time, hrs: mins.	1:00	1:00	1:00
Volume scf db	41.170	36.077	36.805
Particulates collected, grams	0.0290	0.0116	0.0173
Isokinetic Ratio, I%			
$90 \leq I \leq 110$	106.3	100.2	101.7
PARTICULATE			
Concentration grains/scf db (as measured)	0.1087	0.004961	0.0072
x10^{-6} lbs/scf db	1.553	0.7090	1.036
Emission lbs/hr	0.1504	0.06377	0.0937
Concentration grains/scf db corrected to 12% CO_2			
Based on A) Grab Orsat samples	0.02723	0.01308	0.0217
B) Integrated Orsat Sample	0.02918	0.01394	0.0199
Average	0.02821	0.01351	0.0208

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