NEWS

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FOR IMMEDIATE RELEASE

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The Regional Air Pollution Control Agency (RAPCA) has completed its initial review of the results of the stack test conducted on the hazardous waste fuel burning cement kiln at the Southwestern Portland Cement (Southwestern) plant in Greene County. As a result of this review, RAPCA has identified several areas of deficiency with regard to compliance with the company's permit to install and the federal Boiler and Industrial Furnace rule (known as the BIF rule, this recently-enacted regulation applies to cement kilns burning hazardous waste fuels). However, based on an in-house risk screening analysis, RAPCA has not found the measured emissions to pose a significant health threat to area residents.

Attached to this news release is a listing of RAPCA's findings. Of primary concern in the agency's findings is the failure of Southwestern to meet the required Destruction and Removal Efficiency (99.99% destruction) for one of six Principle Organic Hazardous Constituents, chlorobenzene, during one of the three test conditions (condition 1). Excess carbon monoxide levels and elevated total hydrocarbon emissions were also measured during condition 1. For all three test conditions, heavy metal emissions were found within regulatory limits, as well as particulate matter, hydrochloric acid, and sulfur dioxide. It should be noted that based upon a preliminary in-house RAPCA risk assessment, no pollutant, including dioxin, was found to pose a significant health threat to area residents. A more comprehensive risk assessment is to be conducted by Clement International of Washington, D.C. to further define if any health threat exists.

RAPCA is presenting these findings to the OEPA and the company, as well as the Greene County Board of Health, local citizen groups, USEPA, and various hazardous combustion technical experts. Resolution of the issues of concern will require additional, more detailed evaluation and my include further testing. With regard to the company's continued operation of the kiln while the compliance shortcomings are being addressed, RAPCA will confer with Ohio EPA to arrive at joint RAPCA/OEPA recommendations. The target for release of these recommendations is the week of October 15, 1991.

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SWPCCo Stack Test 4/91

RAPCA Findings 9/27/91

Condition 1 - LHWF/tires/coal (high metals input)
Condition 2 - LHWF/tires/coal (low metals input)
Condition 3 - coal only
Condition 4 - detached plume study (LHWF/tires/coal)

1. SWPCCo did not demonstrate compliance with the PTI #08-1411 requirement of 99.99% Destruction and Removal Efficiency (ORE) for all Principal Organic Hazardous Constituents (POHCs) that were tested. Chlorobenzene did not meet four nines in each run of Condition 1 (LHWF/tires/coal). All other POHCs in Condition 1 and all POHCs including chlorobenzene in Condition 2 demonstrated at least 4 nines DRE.

2. RAPCA has performed a preliminary, potential inhalation risk assessment based on the emissions of dioxins and furans (PCDD/PCDF), 4 carcinogenic metals (As, Be, Cd, Cr+6), and 24 other carcinogenic PICs from the main stack, bypass stack, and clinker cooler stack for both Condition 1, run 2 and Condition 3, run 1. The 70-year, ambient average inhalation risk, including dioxins, at a location 700m, bearing 67.5° (ENE) from the main stack (St. Rte 235) has been preliminarily modeled at 3.4e-07 for Condition I, run 2, and 2.2e-07 for Condition 3, run 1. This is equivalent to 0.34 in one million for Cond 1, run 2 (LHWF/tires/coal) and 0.22 in one million for Cond 3, run 1 (coal only). The incremental inhalation risk from coal only to LHWF/tires/coal is 0.12 in on2 million.

3. Average carbon monoxide (CO) emissions in Condition 1 were 120 lb/hr, a 32 lb/hr increase over the 88 lb/hr CO average emission rate measured in Condition 3. The increase in carbon monoxide emissions during Condition 1 over CO emissions in Condition 3 require evaluation in terms of the USEPA Prevention of Significant Deterioration (PSD) regulations.

4. CO levels in the alkali bypass stack do not meet the BIF rule limit of 100 ppmv hourly rolling average, corrected to 7% 02, at all times during both Conditions 1 and 2.

5. Total Hydrocarbon (THC) levels in the alkali bypass stack Comply at all times during the test with the BIF rule limit of 20 ppmv hourly rolling average, corrected to 7% O_2. The PTI #08-1411 emission limit for Organic Compounds is 8.4 TPY. This limit was set based on a DRE calculation, and does not account for the THC generated by the coal or the raw material. The THC emission rates measured during the test include the raw material and coal derived THC, and are listed below:

	TOTAL THC E-MISSION RATES, TPY
Condition 1	104.4
Condition 2	82.9
Condition 3	81.3

6. Preliminary review of products of incomplete combustion (PIC) emission rate data showed that the emission rates did not always correspond to the CO and THC emission rates during the three

Conditions. Average total emission rates of eight prevalent PICs including phenol, benzene, and toluene were lowest in Condition 2 (0.41 lb/hour), higher in Condition 1 (0.64 lb/hour), and highest in the coal only Condition 3 (0.66 lb/hour). However, dioxins/furans (PCDD/PCDF) toxic equivalent average emission rates were:

Condition 1	6.6e-08 Lb/hour
Condition 2	3.6e-08 lb/hour
Condition 3	7.9e-09 lb/hour

The difference in PCDD/PCDF and other carcinogenic PIC emission rates is preliminarily assessed in item #2 above.

7. Particulate and sulfur dioxide (SO_2) emissions comply with the PTI allowable emissions and the BIF rule during all Conditions. Initial review of SO2 emission rates in Condition I. and Condition 3 indicate that the increase in SO2 emissions from Condition 3 to Condition 1 warrants additional review in terms of USEPA PSD requirements.

The average particulate emission rate (Main stack + Bypass stack) in Condition 1 was 12.9 lb/hr, in Condition 2 was 7.8 lb/hr, and in Condition 3 was 8.9 lb/hr. These particulate emission rates are 35% to 58% of the particulate emission rate measured in September 1986, mostly due to the reduction in particulate emissions out the Main stack. The recent rebagging of the Main baghouse and other engineering improvements since 1986 have reduced particulate emissions.

8. Hydrogen chloride (HCl) emissions in all three Conditions comply with the PTI #08-1411 emission limit of 4.0 lb/hour. However, during Condition 4, the HCl emission rate was measured at 21.3 lb/hour. Condition 4 was the detached plume study, which tested the Main and Bypass stacks for particulate, SO_2, and HCl with the SWPCCo Quarry Plant raw mill off.

SO_2 emission rates also are higher, but still less than allowable, in Condition 4. Visible emission data taken by RAPCA during all four Conditions show an increase in stack emissions opacity in Condition 4 over the other Conditions. These data suggest that ammonium chloride and ammonium sulfate are significant contributors to the persistent, opaque, detached plume with the raw mill in the off mode. *The major* contributors to detached plume opacity at SWPCCo's Quarry Plant are ammonium chloride and ammonium sulfate that escape collection in the baghouse due to their gaseous state with the raw mill off and condense as particulate matter after exiting the stack.

9. The 14 metals that were tested during the 4/91 stack test generally exited the kiln in the Bypass baghouse dust and the clinker. A very small fraction (~0.05%) of the 14 metals were emitted from the kiln via the 3 stacks (Main, Bypass, and Clinker Cooler). Lead (Pb) stack emission rates complied with the PTI #08-1411 emission limit of 0.13 lb/hr in all Conditions. USEPA Toxicity' Characteristic Leachate Procedure (TCLP) tests were performed *on* bypass dust and clinker dust samples taken during each Condition, with no exceedances of the regulatory level occurring.

10. The input and output mass flow rates of the 14 tested metals during each Condition are remarkably close, indicating a steady state situation.

There is no clear evidence that metals spiked during Conditions 1 and 2 continue to be emitted 73 hours later in Condition 3. Bypass dust and kiln feed samples taken at the beginning and end of Condition 3 as well as composite samples taken throughout Condition 3 *show very* little change in metals concentrations, indicating a steady state flow of metals through the kiln. Stack emissions of 14 metals during Condition 3, run 1 - run 3, show no clear trend. RAPCA believes the stack emissions of all 14 metals would decrease more significantly if the metals output was much greater than metals input at the start of stack gas sampling in Condition 3.

11. The results of the 4/91 stack test at SWPCCo did not provide a complete demonstration of compliance with all PTI #08-1411, PTO, and BIF rule requirements. The stack test identified certain improvements in the kiln and its monitoring systems that are necessary to demonstrate and ensure continuous compliance with the applicable regulations.

RESULTS AND DISCUSSION

9/30/91

A stack test at Southwestern Portland Cement Co. was performed in April of 1991. The report was submitted to RAPCA on 8/19/91, consisting of 15 volumes and 13,000 pages. The following is a short summary of the analysis of the test results. Metals, CO and THC, POHCs and PICs, particulates, HCl, S02, and a preliminary RAPCA risk assessment are discussed.

Condition 1 - LHWF, tires, and coal (high metals input)
Condition 2 - LHWF, tires, and coal (low metals input)
Condition 3 - coal only
Condition 4 - LHWF, tires, and coal (detached plume study)

METALS

Material balances (input vs. output) were performed for the 14 metals that were tested. Metals input streams were: kiln feed (consisting of indigenous limestone, clay, sand, iron oxide and recycled kiln baghouse dust), coal, LHWF, tires, and metals spiking. Metals output streams were: clinker, bypass baghouse dust, main stack, bypass stack, and clinker stack (a total of 3 stacks). Tables 1 and 2 list the pounds per hour of each metal in each input or output stream.

Metals were input to the kiln in five different streams. For certain metals (As, Ba, Se, Tl, V), kiln feed was the largest contributor to the input. Other metals (Cd, Pb, *Ag, Zn)* originated mostly in the LHWF/tires/spike. See Figures 1 and 2 and Tables 1 and 2.

Total 14 metals output from the kiln in Condition 1 was calculated to be 135 lb/hour. 91.7% was contained in the clinker, 8.2% in the bypass dust, <0.05% from the 3 stacks. See Figure 3.

Total 14 metals output from the kiln in Condition 3 was calculated to be 70 lb/hr. 95.2% was contained in the clinker, 4.7% in the bypass dust, <0.05% from the 3 stacks. See Figure 4.

The technique used to calculate the mass flow rate of each metal in each input or output stream was to measure the mass flow rate of the input or output stream during the test, while sampling and analyzing each stream for the concentration of each metal. Multiplying the input or output stream mass flow rate by the metal concentration gives the individual metal mass flow rate in that particular input *or* output stream.

Often an analysis would indicate a ND (non-detect) for a metal. The concentration of the metal in the given input or output stream would then be assumed to be at the detection limit. Although the detection limit is less than 2 ppm, and usually less than 0.5 ppm, the large mass flow rates of some of the input/output streams may lead to substantial metals input/output mass flow rates, even if the metal was not detected in a sample.

AVG MASS FLOW RATES FOR INPUT/OUTPUT STREAMS DURING 4/91 TEST

stream	input/output	mass flow rate
kiln feed	input	287,551 lb/hour
coal	input	15,250 lb/hr (1&2) / 23,564 lb/hr (Cond 3)
LHWF	input	5,589 lb/hr (Cond 1&2)
tires	input	1,314 lb/hr (Cond 1&2)
clinker	output	169,772 lb/hr
bypass dust	output	9,910 lb/hr

For example, thallium was not detected in a sample of clinker. The detection limit is 0.5 ppm. The output mass flow rate of thallium in the clinker is:

0.5 ppm x le-06 x 169,772 lb/hr = 0.08 lb/hr

0.08 lb/hr is 47% of the thallium exiting the kiln in Cond 1.

The calculated 14 metals total mass flow rates in the input and output streams is shown below.

14 METALS INPUT/OUTPUT

Condition #	Input, lb/hr	Output. lb/hr
1	146	135
2	140	123
3	72	70

Given the uncertainty in measuring and representatively sampling some of the extremely large input or output streams such as kiln feed or bypass dust, the 14 metals input and output mass flow rates are remarkably close. The 14 metals total input and output in Conditions 1 and 2 are about a factor of 2 greater than Condition 3. The table above also illustrates that the kiln was at steady state during the stack sampling. Metals input is approximately equal to metals output during all three Conditions. If one were to observe that the metals output during Condition 3 greatly exceeded the metals input, one would be inclined to view this situation as a delayed release of metals that were spiked at least 73 hours earlier. This information is shown in Figure 5.

With the exception of mercury, the metals exiting the kiln were mostly contained in the clinker and bypass dust. See Figures 3 and 4. However, a difference in metals stack emissions is noted, with higher metals feed rates (Conditions 1 and 2) usually leading to higher stack emissions, as expected. See Figure 6. The 3 stack emission rates of individual metals in Condition 1 ranged from a factor of 0.5 (Be) to 6.5 (Pb) times the individual metals stack emissions in Condition 3.

Mercury 3 stack emissions were 19.6% (Condition 3) to 38.5% (Condition 1) of total mercury output from the kiln (see Figures 7 and 8). The high volatility of mercury (b.p. 674°F) is probably responsible for the much higher fraction of mercury leaving the kiln through the stacks. The total output of mercury in Condition 1 was calculated to be 0.018 lb/hr; 56.3% in the clinker and 5.3% in the bypass dust. The total input of mercury in Condition 1 was calculated to be 0.13 lb/hour. The total output and input of mercury in Condition 3 was calculated to be 0.02 lb/hour and 0.013 lb/hour respectively.

Chromium, with a boiling point of 3992°F, concentrates in the clinker (94.3%) as seen in Figure 9. Total chromium input to the kiln in Condition 1 was calculated to be 14.3 lb/hour. Total chromium output in Condition 3 was calculated to be 8.7 lb/hour. Total chromium input in Condition 3 was calculated to be 9.4 lb/hour.

Cadmium, with a boiling point of 1413°F, concentrates in the bypass dust (84.6%) as seen in Figure 10 (Condition 1). Total cadmium input to the kiln in Condition 1 was calculated to be 1.4 lb/hour. Total cadmium output in Condition 3 was calculated to be 0.03 lb/hour, while total cadmium input in Condition 3 was calculated to be 0.05 lb/hour. The cadmium output in Condition 3 was concentrated in the clinker (see Figure 11).

The maximum measured lead (Pb) 3 stack emission rate during the test was 0.0346 lb/hour (3 stacks, Cond 1, run 2). The average 3 stack emission rate for lead in Condition 1 was 0.0183 lb/hour, 0.0078 lb/hour in Condition 2, 0.0028 lb/hour in Condition 3. The PTI #08-1411 lead allowable is 0.13 lb/hour. The output pie chart for lead (Condition 1) is shown in Figure 12.

It is possible to calculate the 14 metals concentration in the clinker (avg. production rate -170,000 lb/hr) and the bypass dust (avg. production rate '9900 lb/hr). Condition 3 resulted in total 14 metals concentrations of 392 ppm in the clinker and 353 ppm in the bypass dust. Condition 1 resulted in total 14 metals concentrations approximately 2 to 3 times hgher: 730 ppm in the clinker, 1090 ppm in the bypass dust. USEPA Toxicity Characteristic Leachate Procedure (TCLP) tests were performed on clinker dust and bypass dust produced in Conditions 1, 2, 3. All results were below the regulatory limit for the TCLP (see Table 3). While the extraction fluids used in the TCLP are mildly acidic solutions (pH = 4.9 or pH = 2.9) that surely won't leach all metals in the clinker dust or bypass dust, the extraction fluids are much more aggressive than any local tap water.

To help verify steady state metals input/output during Condition 3, bypass dust and kiln feed were sampled at the beginning and end of Condition 3, as well as composite bypass dust and kiln feed samples taken throughout Condition 3. Bypass dust and kiln feed metals concentrations remain fairly constant during Condition 3. See Table 4.

Stack emissions of all 14 metals over 3 runs during Condition 3 do not point to a significant trend either: some (Hg, Se) go up, some (As, Cd, Cr, Pb, Tl) go down, others show no trend. See Table 5. RAPCA believes the stack emissions of all 14 metals would decrease more significantly if the metals output was much greater than metals input at the start of stack gas sampling in Condition 3.

Both the bypass dust and kiln feed metals analyses, as well as the stack emissions show very little change or no significant trends during Condition 3, indicating that the kiln was at steady state during Condition 3, with little or no delayed metals emissions due to the higher metals input in Conditions 1 and 2.

CO and THC

The BIF rule contains provisions for cement kilns equipped with a bypass stack to install a CO (Carbon Monoxide) and THC (Total Hydrocarbon, Cl - C5 organic compounds) Continuous Emission Monitor (CEM) on the bypass stack, which is considered more representative of combustion conditions in the kiln. The main stack THC and CO emissions reflect the presence of organic matter in the raw material fed to the preheater. Bypass stack CEM data generated by SWPCCo during the 4/91 stack test has been collected and analyzed by RAPCA.

It is clear that the THC levels in the bypass stack throughout Conditions 1, 2, 3 comply with the BIF rule limit of 20 ppmv as propane, corrected to 7% 02, on an hourly rolling average basis. Hourly average THC levels vs. time for all three Conditions are shown in Figures 13, 14, 15, 16, 17.

The PTI #08-1411 emission limit for Organic Compounds is 8.4 TPY. This limit was set based on a DRE calculation, and does not account for the THC generated by the coal or the raw material. As a result, even the Condition 3 OC emissions exceed this limit by almost a factor of 10, which indicates significant generation of CO and THC by coal combustion and the naturally-occurring organic matter in the raw material.

THC EMISSION RATES, TONS PER YEAR

	BYPASS	MAIN	TOTAL
Condition 1	0.9	103.5	104.4
Condition 2	6.1	76.8	82.9
Condition 3	1.3	80.0	81.3

CO levels in the bypass stack were significantly higher during Conditions 1 and 2 compared to Condition 3. Hourly average CO levels vs. time for all three Conditions are shown in Figures 18, 19, 20, 21, 22. The BIF CO limit is 100 ppmv, corrected to 7% O_2, on an hourly rolling average basis although the rule contains a provision for an alternative CO limit, based on the average of highest hourly rolling averages measured during each valid run (which has been calculated to be about 101 ppmv, 7% 02). CO data from the bypass stack during the test indicates that the 100 ppmv limit was exceeded at least 7 times during Conditions 1 and 2 (it was never exceeded in Condition 3). Compliance with the BIF rule was not demonstrated in the case of CO levels in the bypass stack.

Average CO emission rates also reflect the higher CO levels in the bypass stack. The increase in CO emissions in Condition 1 over Condition 3 warrants evaluation in terms of the USEPA Prevention of Significant Deterioration (PSD) regulations.

CO EMISSION RATES, TONS PER YEAR

	BYPASS	MAIN	TOTAL
Condition 1	13.6	513.9	527.5
Condition 2	11.7	446.8	458.5
Condition 3	0.8	384.4	385.2