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SOURCE TEST REPORT

NAME OF SOURCE OWNER:	MEGA of Kentucky
ADDRESS OF OWNER:	Louisville, Kentucky
SOURCE IDENTIFICATION:	Simonds Model #AF-58 Incinerator
LOCATION OF SOURCE:	Louisville, Kentucky
TYPE OF OPERATION:	Hospital Waste Incineration
TESTS PERFORMED:	Particulate - EPA Method 5 Hydrogen Chloride - EPA Guidelines Carbon Monoxide - EPA Method 10 Metals - EPA Guidelines
TEST SUPERVISOR:	Russell Berry
DATES TEST PROGRAM CONDUCTED:	August 23 - 25, 1988
OWNER'S REPRESENTATIVES:	Mr. Gary Walwer Mr. Elmer Leibsch

Ref 2-9

MEGA
Louisville,
Kentucky

1.0 INTRODUCTION

Galson Technical Services, Inc. was retained by Medical Energy Generation Associates (MEGA) to conduct source emission testing on the hospital waste incinerator at the MEGA of Kentucky facility in Louisville, Kentucky. Testing was performed during the period August 23 - 25, 1988 to determine emissions of seven potentially toxic metals, particulate matter, hydrogen chloride and carbon monoxide. The primary purpose of the test program was to determine the compliance status of this source with respect to Jefferson County Air Pollution Control District permit conditions.

Messrs. Gary Walwer and Elmer Leibsch, representing MEGA of Kentucky, were responsible for coordinating incinerator operations with the test program. Mr. Don Peterson of the Jefferson County Air Pollution Control District was present to witness the tests.

Results of the test program indicate that, with the exception of lead, emission rates were relatively low for each metal (arsenic, cadmium, chromium, mercury, nickel, and silver), averaging from 0.01 grams/hr for arsenic to 2.0 grams/hr for mercury. Lead emissions were significantly higher, averaging 38 grams/hr. Emissions of particulate matter, hydrogen chloride and carbon monoxide were all below Jefferson County Air Pollution Control District standards. Particulate emissions averaged 2.05 lbs/hr or approximately 89% of the permissible level (2.3 lbs/hr); hydrogen chloride emissions averaged approximately 0.20 lbs/hr or 18% of the permissible

level, and carbon monoxide concentrations (corrected to 12% CO_2) averaged 23 ppmv or 23% of the standard.

2.0 PROCESS DESCRIPTION

The MEGA of Kentucky facility in Louisville, Kentucky incinerates hospital waste on a contract basis; this facility was installed in 1988 and became operational approximately April 1, 1988. The incinerator, manufactured by Simonds Manufacturing Corporation (Model #AF-58), is a dual chamber, controlled air unit. Rated capacity for the incinerator is 1500 lbs/hr, based on a waste heating value of 8500 BTU/lb.

Refuse is fed manually into the weighing hopper and then into the holding bin, with charging of the incinerator performed automatically at approximately 5.5 minute intervals. Ash is removed periodically with an automatic (wet) system.

Each chamber is equipped with one thermostatically controlled, natural gas-fired burner, rated at 4.0×10^6 BTU/hr. The primary chamber burner is used to initiate waste combustion. Typical operating temperatures in the primary chamber are approximately 1500°F. The secondary chamber burner is utilized to ensure complete combustion of the gases exiting the primary chamber. Normal operating temperatures in the secondary chamber are approximately 1900°F.

Exhaust gases exiting the secondary chamber are passed through a variable throat venturi scrubber followed by a vertical cyclonic entrainment separator and packed tower prior to being discharged to atmosphere through a 27" ID stack. The scrubber system was manufactured by Anderson 2000,

Inc. (Models #WAV-111, #VES-111 and #M-10.4) and has a rated capacity of approximately 10,000 acfm. Sodium hydroxide solution is utilized as the scrubbing media.

3.0 PROGRAM/OPERATING CONDITIONS

In accordance with GALSON's protocol submitted to and approved by the Jefferson County Air Pollution Control District, source emission testing was performed at the scrubber outlet in order to determine emissions of seven potentially toxic metals: arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), nickel (Ni) and silver (Ag); particulate matter and hydrogen chloride (HCl). A summary of the test program is presented in Table 1. In general, a total of six tests were conducted; three test runs were performed to determine emissions of the seven metals and three additional tests were performed to determine particulate and hydrogen chloride emissions. In conjunction with each test run, carbon monoxide (CO) concentrations were monitored continuously at the scrubber inlet.

It should be noted that high pressure drops across the sampling train were observed during two test runs (runs #4 and #5). The high pressure drops observed during test run #4 precluded sampling at isokinetic rates for the required 60 minutes, and thus, this test run was voided on site. During test run #5, high pressure drops were also encountered. However, in accordance with EPA procedures, the particulate filter was replaced, and the test run was completed. Results for test run #5 were calculated using the weight gained on both filters.

All testing was performed under normal incinerator and scrubber operating conditions. Incinerator waste charging rates ranged from approximately 77 to 103 percent of design capacity (1500 lbs/hr) during the test program.

Table 1. Test Program

Test #	Date (Time)	Parameters	Incinerator Charge Rate, Avg. (lbs/hr)
1	8/23/88 (1330-1443)	Metals, CO	1480
2	8/24/88 (1040-1145)	Metals, CO	1440
3	8/24/88 (1245-1350)	Metals, CO	1160
4	8/24/88 (1425-1547)	-VOIDED ON SITE-	
5	8/25/88 (0958-1107)	Particulates, HCl, CO	1390
6	8/25/88 (1125-1230)	Particulates, HCl, CO	1550
7	8/25/88 (1300-1405)	Particulates, HCl, CO	1290

1360 Avg (10.7% max CO)

1410 Avg (14% max CO)

Charging rates averaged approximately 91 percent of design capacity during the metals testing and 94 percent of design capacity during the particulate/HCl test periods. The average primary chamber temperatures were above 1500 °F for all test periods, ranging from approximately 1,530 to 1,630 °F; secondary chamber temperatures were maintained above 1,900 °F, averaging from 1950 to 1990 °F.

Process operating data were recorded by MEGA of Kentucky personnel approximately once every 6 minutes during the test periods and included waste charging rate, waste type, primary and secondary chamber temperatures, venturi pressure drop, packed tower pressure drop, scrubber slurry pH, venturi water flow rate, and natural gas consumption. Copies of these data and a summary for each test run are presented in Appendix I.

In order to obtain accurate charging rates, MEGA of Kentucky had the weighing hoppers calibrated prior to testing. However, these calibration results were retained by MEGA and are not included in this report.

4.0 TEST METHODS

Particulate emissions were determined in accordance with EPA Method 5. Sampling equipment manufactured by Nutech Corporation was utilized to conduct the tests. The standard Method 5 sampling train was modified slightly by incorporating 100 ml of 0.1 N sodium hydroxide solution in the first two impingers for the collection of HCl. Note that this modification is in accordance with guidelines issued by EPA and was approved by the Jefferson County Air Pollution Control District prior to testing.

A second isokinetic sampling train was utilized to determine emissions of arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), nickel (Ni) and silver (Ag) in accordance with a recently developed EPA Method.[1] In general, the sampling train consisted of a particulate filter followed by an empty impinger, then two impingers containing 100 ml of a 0.1 N HNO_3/10% H_2O_2 solution, and followed by an impinger containing 100 ml of a 1.5% $KMnO_4$/10% H_2SO_4 solution.

Test ports in the 27 inch ID exhaust stack are located at approximately 17 feet (7.56 diameters) downstream of a 90° bend and 49 feet (21.78 diameters) upstream of the stack exhaust. EPA Method 1 specifies that a twelve (12) point traverse should be conducted when collecting an isokinetic sample at this location. However, due to restricted accessibility, only an eight (8) point traverse was conducted during each test run. Note that problems

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[1] "Methodology For Measurement Of Toxic Metals In Incinerator Stack Emissions" by Thomas E. Ward and M. Rodney Midgett, U.S. EPA, Research Triangle Park, North Carolina.

regarding the accessibility of each test port and the number of traverse points to be sampled were discussed with both Jefferson County and U.S. EPA representatives prior to sampling. At that time, Jefferson County, EPA and GALSON personnel all concurred that sampling at these eight points would provide representative samples. Each point was sampled 7.5 minutes for a total test duration of 60 minutes.

Carbon monoxide and oxygen concentrations were determined in accordance with EPA Methods 10 and 3A, respectively. A Thermo Electron Corporation (TECO) Model 48 gas correlation non-dispersive infrared analyzer was utilized to monitor CO concentrations, and an Infrared Industries Model IR-2200 electrochemical analyzer was utilized to monitor O_2 concentrations. A glass fiber filter and hygroscopic ion exchange membrane (PermaPure Products, Inc.) was employed for stack gas conditioning. Data were recorded as 5-minute averages utilizing a data acquisition/control unit. A portable computer was used to interface with the data acquisition/control unit and also to provide backup data storage. Sampling for CO and O_2 was performed at a single point near the duct centroid, upstream of the scrubber system.

In conjunction with each test run, an integrated flue gas sample was collected at both the scrubber inlet and outlet test locations. Samples were analyzed for $\%CO_2$ and $\%O_2$ using an Orsat apparatus (EPA Method 3). These data were used to determine flue gas molecular weight, and in conjunction with natural gas consumptions, these data were also used to adjust measured particulate, HCl and CO concentrations to 12% CO_2. Sketches

of the test locations and traverse point locations are presented in Appendix II. A more detailed description of the sampling and analytical procedures can be found in Appendix III.

Preliminary Determinations. Prior to the start of testing, a preliminary velocity/cyclonic flow traverse was performed at the test site in accordance with EPA Methods 1 and 2. These data indicated that cyclonic flow was not significant and, therefore, that the test location was acceptable for isokinetic sampling.

Equipment Calibrations All equipment was calibrated either prior to or during use in the field. The Method 5 dry gas meter/pump modules were calibrated immediately prior to this test program, with a post-test QA check also performed. Nozzles and pitots were likewise calibrated prior to use in the field and were visually inspected for damage during the test program. All thermometers, thermocouples and temperature readouts are routinely calibrated at approximately six month intervals; post-test QA checks of the temperature instrumentation were also performed. The carbon monoxide and oxygen monitors were calibrated immediately prior to and following each test run utilizing EPA Protocol No.1 gas standards traceable to National Bureau of Standards reference materials. Interference checks and response time checks were also performed prior to the test program. Copies of the equipment calibration data are presented in Appendix IV.

5.0 RESULTS AND DISCUSSION

Results of the test program are summarized in Tables 2 - 5. Supporting field data and calculations are presented in Appendix V; laboratory data can be found in Appendix VI.

Metals (Table 2.) As shown in Table 2, test results indicate that emission rates were relatively low for arsenic, cadmium, chromium, mercury, nickel, and silver, averaging between 0.01 and 2.0 grams/hr. Lead emissions were significantly higher than those observed for the other six metals, averaging 38 grams/hr. Emissions of arsenic were the lowest, averaging 0.01 grams/hr. With the exception of arsenic emissions, note that emissions rates for each metal vary between tests. This variability is believed to be related to the type and composition of waste being incinerated at any given time.

Particulate Matter (Table 3.) Emissions of particulate matter from the incinerator were below Jefferson County Air Pollution Control District standards during all three test runs. Particulate concentrations ranged from 0.110 to 0.137 grains/dscf and averaged 0.126 grains/dscf (corrected to 12% CO_2). Mass emission rates ranged from approximately 1.92 to 2.26 lbs/hr, averaging 2.05 lbs/hr or approximately 89% of the permissible level (2.3 lbs/hr).

Hydrogen Chloride (Table 4.) Hydrogen chloride emissions were quite variable during the three test periods, ranging from approximately 0.01 to

Table 2. Summary of Results - Toxic Metals

Metal	Test #1	Test #2	Test #3	Avg
Arsenic:				
ug/dscf	0.04	0.05	0.06	0.05
g/hr	0.01	0.01	0.01	0.01
Cadmium:				
ug/dscf	5.3	4.9	19	9.7
g/hr	0.91	0.76	3.3	1.7
Chromium:				
ug/dscf	5.0	2.9	3.1	3.7
g/hr	0.86	0.44	0.52	0.61
Lead:				
ug/dscf	230	220	240	230
g/hr	39	34	40	38
Mercury:				
ug/dscf	8.2	20	9.1	12
g/hr	1.4	3.1	1.5	2.0
Nickel:				
ug/dscf	2.9	4.3	6.5	4.6
g/hr	0.49	0.65	1.1	0.75
Silver:				
ug/dscf	0.31	1.6	0.68	0.86
g/hr	0.05	0.24	0.11	0.13

Table 3. Summary of Results - Particulate Emissions

Test #	Particulate Emissions (gr/dscf)	Particulate Emissions (gr/dscf @ 12% CO_2)	Particulate Emissions (lbs/hr)	Percent of Standard[a]
5	0.101	0.131	2.26	98
6	0.078	0.137	1.92	83
7	0.077	0.110	1.98	86
Avg.	0.085	0.126	2.05	89

[a] 2.3 lbs/hr.

Table 4. Summary of Results - Hydrogen Chloride Emissions

Test #	Hydrogen Chloride Emissions (mg/dscm)	(mg/dscm @ 12% CO_2)	(lbs/hr)	Percent of Standard[a]
5	1.8	2.4	0.02	2
6	53	93	0.57	50
7	0.8	1.1	0.01	1
Avg.	19	32	0.20	18

[a] 1.13 lbs/hr

0.57 lbs/hr and averaging 0.20 lbs/hr. Corresponding concentrations ranged from 1.1 to 93 mg/dscm and averaged approximately 32 mg/dscm (corrected to 12% CO_2). As expected when using a caustic scrubbing system, HCl emissions were substantially reduced, resulting in emissions well below the permissible level of 1.13 lbs/hr during all test periods and averaging 18% of the standard. It is not known why the HCl emission rate was so much higher during test run #2; however, as with the metals emissions, the variability in these results is believed to be related to the composition of waste material being combusted.

Carbon Monoxide (Table 5.) Carbon monoxide concentrations were monitored during all six tests and, in general, were quite low when compared to the 100 ppmv (@ 12% CO_2) standard. When corrected to 12% CO_2, CO concentrations ranged 3 to 52 ppmv and averaged 23 ppmv or 23% of the standard. It should be noted that measured CO concentrations were significantly higher during test runs #2 and #5. In both cases, these tests were performed in the morning approximately one hour after start-up; throughout the day CO emissions dropped significantly.

Except where noted, testing proceeded smoothly with no significant sampling or incinerator operating problems encountered. Isokinesis for the metals and particulate tests was within the allowable range of 100 $\pm$10%.

Table 5. Summary of Results - Carbon Monoxide Emissions

Test #	Carbon Monoxide Emissions (ppmv)	Carbon Monoxide Emissions (ppmv @ 12 % CO_2)	Percent of Standard[a]
1	16	20	20
2	40	52	52
3	5	8	8
5	40	51	51
6	4	6	6
7	2	3	3
Avg.	18	23	23

[a] 100 ppmv @ 12% CO_2

Appendix I. Process Operating Data

Summary of Process Operating Data

Test #	Date (Time)	Charge Rate (lbs/hr)	Incinerator Chamber Temperatures (^{o}F)		Scrubber Operating Parameters				Natural Gas Consumption (ft^3)
			Primary	Secondary	Venturi ΔP(in H_2O)	Tower ΔP(in H_2O)	Slurry pH	H_2O (gpm)	
1	8/23/88 (1330-1443)	1480	1631	1952	1.5	24.0	7.35	11.5	0
2	8/24/88 (1040-1145)	1439	1533	1982	1.3	24.5	7.25	11.5	1100
3	8/24/88 (1245-1350)	1165	1575	1963	1.7	24.5	7.24	11.0	200
5	8/25/88 (0958-1107)	1390	1539	1988	1.5	24.5	7.40	11.0	0
6	8/25/88 (1125-1230)	1549	1553	1950	1.6	24.0	7.30	11.0	300
7	8/25/88 (1300-1405)	1289	1540	1971	2.0	24.0	7.25	11.0	50

Process Weight Calculations

Test #1 (1330-1443)
8/23/88

Time	Charge Weight (lbs)
13:30	Start
13:36	128.9
13:41	124.2
13:46	131.2
13:52	127.4
13:57	140.0
14:02	128.3
14:07	122.0
14:13	131.7
14:18	121.3
14:23	132.8
14:29	119.3
14:34	131.9
14:39	137.8
14:43	123.8
	Total 1800.6

Total Weight Charged = 1800.6 lbs in 73 minutes (1330-1443)

Charge Rate = 1800.6 x 60/73

= 1480 lbs/hr

Process Weight Calculations

Test #2 (1040-1145)
8/24/88

Time	Charge Weight (lbs)
10:38	Start
10:44	131.5
10:49	137.8
10:54	135.9
11:00	125.7
11.03	0
11:06	131.4
11:11	131.3
11:17	135.4
11:22	136.5
11:28	140.1
11:33	130.7
11:38	120.6
11:44	126.4
	Total 1583.3

Total Weight Charged = 1583.3 lbs in 66 minutes (1038-1144)

Charge Rate = 1583.3 x 60/66

= 1439 lbs/hr

Process Weight Calculations

Test #3 (1245-1350)
8/24/88

Time	Charge Weight (lbs)
12:44	Start
12:49	116.9
12:55	97.8
13:00	115.9
13:05	129.9
13:11	113.0
13:16	0
13:22	122.9
13:27	112.5
13:33	128.2
13:38	102.8
13:44	124.8
	Total 1164.7

Total Weight Charged = 1164.7 lbs in 60 minutes (1244-1344)

Charge Rate = 1164.7 x 60/60

= 1165 lbs/hr

Process Weight Calculations

Test #5 (0958-1107)
8/25/88

Time	Charge Weight (lbs)
10:04	Start
10:08	128.6
10:15	132.1
10:20	134.9
10:25	126.2
10:30	122.0
10:36	121.9
10:42	132.9
10:47	129.7
10:53	116.1
10:58	122.0
11:04	123.7
	Total 1390.1

Total Weight Charged = 1390.1 lbs in 60 minutes (1004-1104)

Charge Rate = 1390.1 x 60/60

= 1390 lbs/hr

Process Weight Calculations

Test #6 (1125-1230)
8/25/88

Time	Charge Weight (lbs)
11:31	Start
11:36	125.5
11:42	127.7
11:48	119.5
11:52	83.4
11:55	95.4
12:00	127.0
12:05	125.9
12:09	128.2
12:11	128.2
12:15	125.0
12:22	130.7
	Total 1316.5

Total Weight Charged = 1316.5 lbs in 51 minutes (1131-1222)

Charge Rate = 1316.5 x 60/51

= 1549 lbs/hr

Process Weight Calculations

Test #7 (1300-1405)
8/25/88

Time	Charge Weight (lbs)
12:56	Start
13:00	115.0
13:05	118.0
13:11	115.3
13:16	129.3
13:22	115.9
13:28	110.0
13:33	104.8
13:38	116.8
13:44	116.5
13:49	113.1
13:56	107.4
14:00	112.3
	Total 1374.4

Total Weight Charged = 1374.4 in 64 minutes (1256-1400)

Charge Rate = 1374.4 x 60/64

= 1289 lbs/hr

SOURCE TEST REPORT

NAME OF SOURCE OWNER:	MEGA of Kentucky
ADDRESS OF OWNER:	Louisville, Kentucky
SOURCE IDENTIFICATION:	Simonds Model #AF-58 Incinerator
LOCATION OF SOURCE:	Louisville, Kentucky
TYPE OF OPERATION:	Hospital Waste Incineration
TESTS PERFORMED:	CEM Certification - PST 4 Carbon Monoxide - EPA Method 10 Oxygen - EPA Method 3A
TEST SUPERVISOR:	Russell Berry
DATES TESTS CONDUCTED:	May 17 - 18, 1989
OWNER'S REPRESENTATIVES:	Mr. Gary Walwer Mr. Elmer Leibsch

1.0 INTRODUCTION

Source emission testing was performed on May 17 and 18, 1989 at the Medical Energy Generation Associates (MEGA) facility in Louisville, Kentucky. Testing was performed on the hospital waste incinerator by Galson Technical Services, Inc. to determine gas concentrations of carbon monoxide (CO) and oxygen (O_2). The primary purpose of the test program was to evaluate the performance of CO and O_2 continuous emission monitors (CEMs).

Messrs. Gary Walwer and Elmer Leibsch, representing MEGA of Kentucky, were responsible for coordinating incinerator operations with the test program. Mr. John McCarthy of the Jefferson County Air Pollution Control District (APCD) was present to witness the tests.

Results of the test program indicate that the CO CEM system was operating within EPA performance specifications. The CO CEM relative accuracy was approximately 3 parts per million by volume (ppmv) — below the 5 ppmv maximum permissible level (5 percent of the CO standard). The O_2 CEM relative accuracy was approximately 6.3 percent of EPA Reference Method test results, and this is below the maximum permissible value of 20 percent. The CO analyzer passed both zero and span 7-day drift checks with a maximum 24-hour drift of 0.78 percent — below the 5 percent permissible level. The O_2 analyzer passed a 7-day zero drift check with a maximum 24-hour drift of 0.4 percent (absolute); however, 24-hour span drifts ranged from 0.2 to 1.5 percent (absolute) — exceeding the 0.5 percent (absolute) permissible

level. It should be noted that, according to MEGA and Horiba representatives, the excessive span drifts were due to changes in calibration gas pressures from one calibration to the next and not due to inability of the instrument. Furthermore, the regulator pressure gauge for the O_2 span gas cylinder has been replaced with a more accurate gauge in order to eliminate this problem.

2.0 PROCESS DESCRIPTION

The MEGA of Kentucky facility in Louisville, Kentucky incinerates hospital waste on a contract basis; this facility was constructed in 1988 and became operational approximately April 1, 1988. The incinerator, manufactured by Simonds Manufacturing Corporation (Model #AF-58), is a dual chamber, controlled air unit. Rated capacity for the incinerator is 1500 pounds per hour (lbs/hr), based on a waste heating value of 8500 Btu/lb.

Refuse is loaded manually into the weighing hopper and then fed automatically into the charging bin; charging of the incinerator is performed automatically at approximately 5.5 minute intervals. Ash is removed periodically with an automatic (wet) system.

Each chamber is equipped with one thermostatically controlled, natural gas-fired burner, rated at 4.0×10^6 Btu/hr. The burner located in the primary chamber is used to preheat the refractory and to initiate waste combustion. Typical operating temperatures in the primary chamber are approximately 1500°F. The secondary chamber burner is utilized to ensure complete combustion of gases exiting the primary chamber by providing extended gas residence time. Normal operating temperatures in the secondary chamber are approximately 1900°F.

Exhaust gases exiting the secondary chamber are passed through a variable throat venturi scrubber followed by a vertical cyclonic entrainment

separator and packed tower prior to being discharged to the atmosphere through a 27 inch ID stack. The scrubber system was manufactured by Anderson 2000, Inc. (Models #WAV-111, #VES-111, and #M-10.4) and has a rated capacity of approximately 10,000 acfm. Sodium hydroxide solution is used as the scrubbing media.

3.0 TEST PROGRAM

Source emission testing was performed on the incinerator to determine carbon monoxide and oxygen concentrations. A total of 12 EPA Reference Method test runs for both CO and O_2 were performed on May 17 and 18, 1989.

In accordance with EPA 40 CFR 60 Performance Specifications 3 and 4, the relative accuracies of the CO and O_2 CEMs were calculated using data from nine of the twelve EPA Reference Method test runs and the following equations:

$$RA = |\bar{d}| + |CC| \quad \text{(for the CO CEM)}$$

$$RA = \frac{|\bar{d}| + |CC|}{RM} \times 100 \quad \text{(for the } O_2 \text{ CEM)}$$

$$CC = t \times S_d/(n)^{0.5}$$

where:

RA = relative accuracy

$|\bar{d}|$ = mean absolute value of the differences between the CEM and reference method values

$|CC|$ = absolute value of the 2.5% error confidence coefficient

RM = average reference method value

t = student t-value (2.5% error, one-tailed)

S_d = standard deviation of the differences between the CEM and reference method values

n = number of data points (9).

The true accuracy of the CEM should be equal to or better than the relative accuracy during 95% of the operating time. Note that the relative accuracy for the CO CEM is calculated in units of the standard (ppmv) and compared directly with a limit equal to 5 percent of the standard (as opposed to 10 percent of the average reference method value). Typically, an analyzer is certified by comparing CEM values to 5 percent of the standard only when reference method values — and CEM values — are relatively low compared to the standard.

In addition to the relative accuracy test audit, MEGA personnel performed a 7-day drift check on the CEM during the period of May 23 through June 1, 1989. These data were then provided to GALSON and are included in this report.

All testing was performed during normal incinerator operating conditions. The incinerator was operating at an average rate of 1,100 lbs/hr or approximately 73 percent of rated capacity. Incinerator operating data were recorded by plant personnel at approximately 6-minute intervals during the test period. These data included CEM data, load weight, total load weight, and primary and secondary incinerator temperatures. Copies of these data are presented in Appendix I.

4.0 TEST METHODS

All testing was performed in accordance with EPA New Source Performance Standards (NSPS) Appendix B Performance Specification Test (PST) #4 procedures. Carbon monoxide sampling was conducted in accordance with EPA Reference Method 10, and oxygen sampling was conducted in accordance with EPA Reference Method 3A. As required by PST #4 the potential for carbon dioxide interference was avoided by using a potassium permanganate/sodium hydroxide solution to remove carbon dioxide from the sample gas. A three point traverse was conducted during each test run at 16.7, 50.0 and 83.3 percent of the inside duct diameter; each point was sampled 10 minutes for a duration of 30 minutes per test run.

In conjunction with each test run, integrated gas samples were collected and analyzed for percent O_2 and percent CO_2 in accordance with EPA Reference Method 3.

Sketches of the test location are presented in Appendix II. A more detailed description of the sampling and analytical procedures can be found in Appendix III.

Equipment Calibrations. Both analyzers were calibrated on site immediately prior to and following each test run utilizing gas standards traceable to National Bureau of Standards Reference Materials. Interference checks and response time checks were performed prior to use in the field. Copies of these calibration data are presented Appendix IV.

5.0 RESULTS AND DISCUSSION

Reference Method test results, corresponding CEM results, absolute differences, confidence coefficient (CC) and relative accuracies (RA) are presented in Tables 1 and 2 for the CO and O_2 CEMs, respectively. Carbon monoxide and oxygen CEM 7-day drift results are presented in Tables 2 and 3. Supporting field data, and calculations are presented in Appendix V.

As previously mentioned, the EPA requires that CEM relative accuracy be calculated using nine of the twelve test runs. For the CO analyzer, results were calculated omitting test runs 5, 9, and 12. The O_2 analyzer results were calculated omitting test runs 2, 5, and 10. Note that these test runs were discarded because they exhibited the largest difference between Reference Method and CEM values.

Carbon Monoxide CEM Relative Accuracy (Table 1). Carbon monoxide concentrations averaged approximately 11.3 ppmv for the Reference Method tests, and corresponding CEM concentrations averaged approximately 10.5 ppmv. The average difference was approximately 2.1 ppmv with a 0.9 ppmv 95 percent confidence coefficient. The CO CEM relative accuracy was approximately 3 ppmv — below the 5 ppmv maximum permissible level.

Oxygen CEM Relative Accuracy (Table 2). Oxygen concentrations averaged approximately 10.6% for the reference method tests, and corresponding CEM concentrations averaged approximately 10.9%, yielding an average difference

of approximately 0.5 percent. The O_2 CEM relative accuracy was approximately 6.3 percent of EPA reference method test results, below the maximum permissible value of 20 percent.

Carbon Monoxide and Oxygen CEM 7-Day Drift Checks (Tables 3 and 4). The CO analyzer passed both zero and span 7-day drift checks with a maximum 24-hour zero drift of 0.08 percent and a maximum 24-hour span drift of 0.78 percent, compared to a 5 percent permissible drift. The O_2 analyzer passed a 7-day zero drift check with a maximum 24-hour drift of 0.4 percent (absolute); however, 24-hour span drifts ranged from 0.2 to 1.5 percent (absolute), exceeding the permissible drift of 0.5 percent (absolute). It should be noted that, according to MEGA and Horiba representatives, the excessive span drifts were due to changes in calibration gas pressures from one calibration to the next and not due to the stability of the instrument. Furthermore, the pressure gauge used to regulate O_2 span gas calibration pressure has been replaced with a more accurate gauge in order to eliminate this problem.

Table 1. Relative Accuracy
CO Analyzer - MEGA of Kentucky

	CO Concentrations (ppmv)		
Run #	Reference Method	Monitor	Difference
1	13.1	14.1	1.0
2	10.4	6.6	3.8
3	15.4	12.7	2.7
4	13.4	11.5	1.9
5[a]	22.1	26.3	4.2
6	4.2	3.3	0.9
7	18.5	14.9	3.6
8	8.2	8.8	0.6
9[a]	24.6	12.0	12.6
10	13.4	14.5	1.1
11	5.2	8.1	2.9
12[a]	11.2	16.0	4.8
Average	11.3	10.5	2.1

Confidence Coefficient: 0.9
Relative Accuracy: 3.0

[a] Runs 5, 9, and 12 were omitted from the relative accuracy (RA) calculations.

Table 2. Relative Accuracy
O_2 Analyzer - MEGA of Kentucky

Run #	O_2 Concentrations (%) Reference Method	Monitor	Difference
1	11.7	11.4	0.3
2[a]	9.4	10.2	0.8
3	11.3	11.6	0.3
4	10.6	10.8	0.2
5[a]	10.5	11.5	1.0
6	9.4	9.7	0.3
7	10.7	11.5	0.8
8	9.7	10.2	0.5
9	10.6	11.4	0.8
10[a]	10.5	11.6	1.1
11	10.2	10.6	0.4
12	11.1	10.6	0.5
Average	10.6	10.9	0.5
		Confidence Coefficient:	0.17
		Relative Accuracy:	6.3

[a] Runs #5, 9, and 12 were omitted from the relative accuracy (RA) calculations.

Table 3. CO 24-hr Zero and Calibration Drift Checks

Date	Zero Reading				Hi-Range Reading			
	Calibration Value (ppmv)	Monitor Value (ppmv)	Zero Drift (ppmv)	Percent[a] Of Span (%)	Calibration Value (ppmv)	Monitor Value (ppmv)	Span Drift (ppmv)	Percent[a] Of Span (%)
23-May	0.0	0.0	-	-	163.0	163.0	-	-
24-May	0.0	0.0	0.0	0.00	163.0	162.5	0.5	0.10
25-May	0.0	0.4	0.4	0.08	162.5	161.2	1.3	0.26
26-May	0.4	0.1	0.3	0.06	161.2	161.5	0.3	0.06
27-May	0.1	0.5	0.4	0.08	161.5	165.4	3.9	0.78
29-May	0.5	0.5	0.0	0.00	165.4	161.5	3.9	0.78
30-May	0.5	0.7	0.2	0.04	161.5	161.0	0.5	0.10
31-May	0.7	0.5	0.2	0.04	161.0	160.0	1.0	0.20

[a] Span Value = 500 ppm

Table 4. O_2 24-hr Zero and Calibration Drift Checks

Date	Zero Reading			Hi-Range Reading		
	Calibration Value (%)	Monitor Value (%)	Zero Drift (%)	Calibration Value (%)	Monitor Value (%)	Span Drift (%)
23-May	0.0	0.0	-	20.8	20.8	-
24-May	0.0	0.4	0.4	20.8	20.6	0.2
25-May	0.4	0.2	0.2	20.6	20.0	0.6
26-May	0.2	0.1	0.1	20.0	21.5	1.5
27-May	0.1	0.1	0.0	21.5	20.8	0.7
29-May	0.1	0.1	0.0	20.8	20.0	0.8
30-May	0.1	0.1	0.0	20.0	20.6	0.6
31-May	0.1	0.1	0.0	20.6	20.1	0.5

[a] Span Value = 25 %

APPENDIX I

PROCESS OPERATING DATA

Summary of CEM Certification Results

Test No.	Date (Time)	Charge Rate (lbs/hr)	CO CEM (ppmv)	O_2 CEM (%)
1	5/17/89 (1716 - 1753)	1542	14.1	11.4
2	5/17/89 (1803 - 1833)	912	6.6	10.2
3	5/17/89 (1843 - 1908)	1270	12.7	11.6
4	5/17/89 (1928 - 1958)	876	11.5	10.8
5	5/17/89 (2013 - 2043)	1373	26.3	11.5
6	5/17/89 (2053 - 2123)	1325	3.3	9.7
7	5/17/89 (2153 - 2223)	1012	14.9	11.5
8	5/17/89 (2233 - 2303)	970	8.8	10.2
9	5/17/89 (2313 - 2343)	1221	12.0	11.4
10	5/17-18/89 (2353 - 0029)	1199	14.5	11.6
11	5/18/89 (0039 - 0109)	896	8.1	10.6
12	5/18/89 (0119 - 0149)	684	16.0	10.6

MediGen

RECEIVED
JUN 09 1989
GALSON COMPANIES

7 DAY DRIFT TEST FOR C.E.M

PERFORMED BY : GARY WALWER MEDI GEN
WITNESSED BY : JOHN McCARTHY JEFF. COUNTY

DAY	PRESENT READING	CO ZERO O2 SPAN	AMOUNT OF DRIFT	CO SPAN O2 ZERO	AMOUNT OF DRIFT	MISC
TUES 5/23		0 CO 20.8 O2		163 0		START
WED 5/24	5.1 CO 10.6 O2	0 CO 20.6 O2	0 .2	162.5 .4	.5 .4	
THUR 5/25	8.6 CO 11.6 O2	.4 CO 20. O2	.4 .8	161.2 .2	1.8 .2	
FRI 5/26	49 CO 14.8 O2	.1 CO 21.5 O2	.1 .7	161.5 .1	1.5 .1	
SAT 5/27	12.3 CO 11.2 O2	.5 CO 20.8 O2	.5 0	165.4 .1	2.4 .1	
MON 5/29	11.6 CO 18.2 O2	.5 CO 20. O2	.5 .8	161.5 .1	1.5 .1	
TUES 5/30	15.8 CO 8.5 O2	.7 CO 20.6 O2	.7 .2	161. .1	2. .1	
WED 5/31	14.5 CO 15.2 O2	.5 CO 20.1 O2	.5 .7	160. .1	3. .1	
THUR 6/1	18.6 CO 12.6 O2	.5 CO 20. O2	.5 .8	161.2 .1	1.8 .1	

GARY WALWER

Gary Walwer

PLANT MANAGER MEDI GEN OF KY.

MediGen of Kentucky, Inc.
P.O. Box 19706 7100 Grade Lane Louisville, KY 40219-0706 (502) 368-0525 FAX (502) 368-0580

MediGen

Results of 7 day drift test for period of Oct.3 1989 thru Oct 10 1989

Day	Present O2 Reading	O2 Span	Amount of drift	O2 Zero	Amount of drift	
10/3	13.8	20.8	-	0	-	start
10/4	11.2	20.6	.2	0	0	
10/5	11.3	20.8	0	0	0	
10/6	13.7	20.3	.5	0	0	
10/7	12.6	20.9	.1	.1	.1	
10/8	12.5	20.8	0	0	0	
10/9	6.8	20.6	.2	0	0	
10/10	12.5	20.5	.3	.1	.1	

This test was performed under the supervision of John McCarthy from the Jefferson County Air Pollution Control District and Gary Walwer from MediGen of Ky. It is submitted without prejudice and is accurate to the best of our knowledge.

Gary Walwer

Gary Walwer
PLant Manager

MediGen of Kentucky, Inc.
P.O. Box 19706 7100 Grade Lane Louisville, KY 40219-0706 (502) 368-0525 FAX (502) 368-0580

SOURCE TEST REPORT

NAME OF SOURCE OWNER:	MEGA of Kentucky
ADDRESS OF OWNER:	Louisville, Kentucky
SOURCE IDENTIFICATION:	Simonds Model #AF-58 Incinerator
LOCATION OF SOURCE:	Louisville, Kentucky
TYPE OF OPERATION:	Hospital Waste Incineration
TESTS PERFORMED:	PCDD/PCDF - EPA Modified Method 5
TEST SUPERVISOR:	Russell Berry
DATES TESTS CONDUCTED:	November 15 - 16, 1988
OWNER'S REPRESENTATIVES:	Mr. Gary Walwer Mr. Elmer Leibsch

1.0 INTRODUCTION

Galson Technical Services, Inc. was retained by Medical Energy Generation Associates (MEGA) to conduct source emission testing on the hospital waste incinerator at the MEGA of Kentucky facility in Louisville, Kentucky. Testing was performed on November 15 and 16, 1988 to determine emissions of polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF). The primary purpose of the test program was to provide Jefferson County Air Pollution Control District with PCDD/PCDF emissions results and satisfy special permit conditions.

Messrs. Gary Walwer and Elmer Leibsch, representing MEGA of Kentucky, were responsible for coordinating incinerator operations with the test program. Messrs. John McCarthy and Don Peterson of the Jefferson County Air Pollution Control District (APCD) were present to witness the tests.

Results of the test program indicate that, PCDD and PCDF emission rates were low for all three test runs. PCDD/PCDF concentrations, reported as equivalent concentrations of 2,3,7,8-tetrachlorinated dibenzo-p-dioxins, averaged < 0.131 nanograms per dry standard cubic meter (ng/dscm). Corresponding mass emissions rates averaged < 0.163 nanograms per second (ng/sec).

2.0 PROCESS DESCRIPTION

The MEGA of Kentucky facility in Louisville, Kentucky incinerates hospital waste on a contract basis; this facility was installed in 1988 and became operational approximately April 1, 1988. The incinerator, manufactured by Simonds Manufacturing Corporation (Model #AF-58), is a dual chamber, controlled air unit. Rated capacity for the incinerator is 1500 pounds per hour (lbs/hr), based on a waste heating value of 8500 Btu/lb.

Refuse is loaded manually into the weighing hopper and then fed automatically into the charging bin; charging of the incinerator is performed automatically at approximately 5.5 minute intervals. Ash is removed periodically with an automatic (wet) system.

Each chamber is equipped with one thermostatically controlled, natural gas-fired burner, rated at 4.0×10^6 Btu/hr. The burner located in the primary chamber is used to preheat the refractory and to initiate waste combustion. Typical operating temperatures in the primary chamber are approximately 1500°F. The second burner, located in the secondary combustion chamber, is utilized to ensure complete combustion of the gases exiting the primary chamber. Normal operating temperatures in the secondary chamber are approximately 1900°F.

Exhaust gases exiting the secondary chamber are passed through a variable throat venturi scrubber followed by a vertical cyclonic entrainment separator and packed tower prior to being discharged to atmosphere through a 27 inch ID stack. The scrubber system was manufactured by Anderson 2000, Inc. (Models #WAV-111, #VES-111 and #M-10.4) and has a rated capacity of approximately 10,000 acfm. Sodium hydroxide is utilized as the scrubbing media.

3.0 TEST PROGRAM/OPERATING CONDITIONS

In accordance with GALSON's protocol submitted to and approved by the Jefferson County Air Pollution Control District, source emission testing was performed at the scrubber outlet in order to determine emissions of PCDD and PCDF. Testing was performed in triplicate under normal incinerator and scrubber operating conditions.

Incinerator waste charging rates ranged from approximately 87 to 108% and averaged approximately 98% of design capacity (1500 lbs/hr) during the test program. The average primary chamber temperatures were above 1500°F for all test periods, ranging from approximately 1535 to 1600°F. Secondary chamber temperatures were maintained above 1900°F; the four-hour test averages ranged from 2002 to 2079°F.

Process operating data were recorded by MEGA of Kentucky personnel approximately once every six minutes during the test periods and included waste charging rate, waste type, primary and secondary chamber temperatures, venturi pressure drop, packed tower pressure drop, scrubber slurry pH, venturi water flow rate, and natural gas consumption. Copies of these data and a summary of each test run are presented in Appendix I.

4.0 TEST METHODS

Emissions of PCDD and PCDF were determined in accordance with the California Air Resources Board (CARB) Method 428. Sampling equipment manufactured by Nutech Corporation was utilized to conduct the tests. Sampling was performed utilizing Modified Method 5 procedures, with XAD-2 resin employed as the sorbent. Front-half (probe rinse and filter) and back-half (condenser rinse and XAD-2 resin) samples were analyzed independently utilizing high resolution gas chromatography/mass spectrometry, following soxhlet extraction. Quantification was provided for the tetra- through octa- homologues and specific 2, 3, 7, 8, x isomers as identified below:

2,3,7,8 TCDD	2,3,7,8 TCDF
Total TCDD	Total TCDF
1,2,3,7,8 PeCDD	1,2,3,7,8 PeCDF
Total PeCDD	2,3,4,7,8 PeCDF
1,2,3,4,7,8 HxCDD	Total PeCDF
1,2,3,6,7,8 HxCDD	1,2,3,4,7,8 HxCDF
1,2,3,7,8,9 HxCDD	1,2,3,6,7,8 HxCDF
Total HxCDD	2,3,4,6,7,8 HxCDF
1,2,3,4,6,7,8 HpCDD	1,2,3,7,8,9 HxCDF
Total HpCDD	Total HxCDF
Total OCDD	1,2,3,4,6,7,8 HpCDF
	1,2,3,4,7,8,9 HpCDF
	Total HpCDF
	Total OCDF

It should be noted that results are presented as equivalent concentrations and mass emissions of 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (TCDD). Equivalent TCDD emissions were calculated using CARB toxic equivalency factors (TEF). Furthermore, if a PCDD/PCDF isomer was non-detectable, calculations were performed using detection limit values, representing worst case conditions.

Test ports in the 27 inch ID exhaust stack are located at approximately 17 feet (7.56 diameters) downstream of a 90° bend and 49 feet (21.78 diameters) upstream of the stack exhaust. As specified by EPA Method 1, a twelve (12) point traverse was conducted during each test run; each point was sampled 20 minutes for a total test duration of 240 minutes.

Exhaust gas volumetric flow rate and moisture content were determined as part of the Modified Method 5 tests as per EPA Methods 2 and 4. In addition, integrated gas samples were collected at the scrubber inlet and outlet and analyzed for %CO2 and %O2 using an Orsat apparatus (EPA Method 3). These data were used to determine flue gas molecular weight.

A sketch of the test location and traverse point locations are presented in Appendix II. A more detailed description of the sampling and analytical procedures can be found in Appendix III.

Preliminary Determinations. Prior to the start of testing, a preliminary velocity/cyclonic flow traverse was performed at the test site in accordance with EPA Methods 1 and 2. These data indicated that cyclonic flow was not significant, and therefore, the test location was acceptable for isokinetic sampling.

Equipment Calibrations. All equipment was calibrated either prior to or during use in the field. The Method 5 dry gas meter/pump modules were calibrated immediately prior to this test program, with a post-test QA check also performed. Nozzles and pitots were likewise calibrated prior to use in the field and were visually inspected for damage during the test program. All thermometers, thermocouples and temperature readouts are routinely calibrated at approximately twelve month intervals; post-test QA checks of the temperature instrumentation were also performed. Copies of the equipment calibration data are presented in Appendix IV.

5.0 RESULTS AND DISCUSSION

Results of the test program are summarized in Tables 1 through 3. Supporting field data and calculations are presented in Appendix V; laboratory data can be found in Appendix VI.

As shown in Table 1, equivalent concentrations of 2,3,7,8-TCDD were low, averaging < 0.131 nanograms per dry standard cubic meter (ng/dscm). Corresponding mass emissions rates averaged < 0.163 nanograms per second (ng/sec). These emissions are relatively low compared to published PCDD/PCDF emissions observed at similar sources in other states. It should be noted that these values have not been blank corrected. Equivalent 2,3,7,8-TCDD concentrations and mass emissions for the field blank were approximately 10 percent (%) of the three-test averages, indicating that the samples were not exposed to any significant levels of PCDD/PCDF during sample recovery.

Reviewing Tables 2 and 3, note that several PCDD and PCDF compounds were non-detectable. Total concentrations of PCDD and PDCF ranged from < 0.262 to < 0.410 ng/dscm and from < 1.647 to < 3.582 ng/dscm, respectively. Corresponding mass emissions rates ranged from < 0.328 to < 0.504 ng/sec for PCDD and from < 2.017 to < 4.404 ng/sec for PCDF.

In general, all testing proceeded smoothly with no sampling or incinerator operating problems encountered. Isokinetic sampling conditions were maintained within the allowable range of 100 $\pm$ 10% for all test runs.

Table 1. Summary of Results - Average 2, 3, 7, 8 - TCDD Equivalent Emissions

	CARB Scenario IV[a] Concentration (ng/dscm)	CARB Scenario IV[a] Emission Rate (ng/sec)
Three-test Average		
Total PCDD	<0.012	<0.015
Total PCDF	<0.119	<0.148
Total PCDD + PCDF	<0.131	<0.163
Field Blank[b]		
Total PCDD	<0.007	<0.009
Total PCDF	<0.008	<0.009
Total PCDD + PCDF	<0.015	<0.018

[a] Non-detectable Congeners = Detection Limit

[b] Three-test average sample volume and exhaust gas flow rate were assumed.

Table 2. Summary of Results - PCDD Emissions[a] (Individual Isomers)

	Test #1		Test #2		Test #3	
	ng/dscm	ng/sec	ng/dscm	ng/sec	ng/dscm	ng/sec
Isomer:						
2,3,7,8-TCDD	<0.002	<0.003	<0.004	<0.006	<0.005	<0.006
Other TCDD	0.089	0.019	0.0	0.0	0.026	0.033
1,2,3,7,8-PeCDD	<0.003	<0.004	<0.007	<0.008	<0.007	<0.009
Other PeCDD	0.0	0.0	0.067	0.083	0.045	0.056
1,2,3,4,7,8-HxCDD	<0.004	<0.005	<0.008	<0.010	<0.008	<0.010
1,2,3,6,7,8-HxCDD	<0.004	<0.005	<0.008	<0.010	<0.009	<0.012
1,2,3,7,8,9-HxCDD	<0.004	<0.005	<0.010	<0.012	<0.010	<0.013
Other HxCDD	0.006	0.007	0.079	0.097	0.099	0.124
1,2,3,4,6,7,8-HpCDD	0.087	0.107	0.095	0.117	0.053	0.066
Other HpCDD	0.070	0.085	0.131	0.161	0.0	0.0
Total OCDD	0.0	0.0	0.0	0.0	0.0	0.0
Total PCDD	<0.268	<0.328	<0.410	<0.504	<0.262	<0.329

[a] Emissions were determined assuming non-detectable isomers were present at the reported dectection limit. Zero (0) values represent cases in which the isomer was non-detectable and no detection limit was provided.

Table 3. Summary of Results - PCDF Emissions[a] (Individual Isomers)

	Test #1		Test #2		Test #3	
	ng/dscm	ng/sec	ng/dscm	ng/sec	ng/dscm	ng/sec
Isomer:						
2,3,7,8-TCDF	0.026	0.032	0.051	0.062	0.036	0.046
Other TCDF	0.982	1.202	1.838	2.260	1.050	1.320
1,2,3,7,8-PeCDF	<0.002	<0.003	0.064	0.079	0.049	0.061
2,3,4,7,8-PeCDF	<0.002	<0.003	0.103	0.126	<0.003	<0.004
Other PeCDF	0.219	0.268	0.697	0.857	0.262	0.329
1,2,3,4,7,8-HxCDF	0.054	0.066	0.114	0.140	0.075	0.095
1,2,3,6,7,8-HxCDF	<0.002	<0.003	0.064	0.079	<0.003	<0.004
2,3,4,6,7,8-HxCDF	0.040	0.049	0.061	0.074	0.063	0.079
1,2,3,7,8,9-HxCDF	<0.005	<0.006	<0.009	<0.011	<0.006	<0.007
Other HxCDF	0.147	0.180	0.328	0.403	0.182	0.229
1,2,3,4,6,7,8-HpCDF	0.079	0.097	0.142	0.175	<0.004	<0.005
1,2,3,4,7,8,9-HpCDF	<0.008	<0.009	<0.013	<0.017	<0.017	<0.021
Other HpCDF	0.071	0.087	0.083	0.102	0.0	0.0
Total OCDF	<0.010	<0.012	<0.014	<0.018	0.092	0.116
Total PCDF	<1.647	<2.017	<3.582	<4.404	<1.842	<2.315

[a] Emissions were determined assuming non-detectable isomers were present at the reported dectection limit. Zero (0) values represent cases in which the isomer was non-detectable and no detection limit was provided.

Appendix I. Process Operating Data

Summary of Process Operating Data

Test #	Date (Hours)	Charge Rate (lbs/hr)	Incinerator Chamber Temperatures (F)		Scrubber Operating Parameters				Natural Gas Consumption (ft^3)
			Primary	Secondary	Venturi ΔP(in H_2O)	Tower ΔP(in H_2O)	Slurry pH	H_2O (gpm)	
1	11/15/88 (1310-1730)	1309	1563	2004	21	0	7.35	13.0	300
2	11/16/88 (0910-1340)	1479	1600	2002	21	0	7.15	11.5	900
3	11/16/88 (1421-1843)	1619	1535	2079	21	0	7.33	11.7	100
AVG.	———	1469	1566	2028	21	0	7.28	12.1	433

AIR POLLUTION CONTROL DISTRICT OF JEFFERSON COUNTY

914 East Broadway • Louisville, Kentucky 40204

CONSTRUCTION PERMIT

Permit No. 219-87 Effective Date Sep 30, 1989 Expiration Date Mar 30, 1990

Permit Fee $200.00 EIS Plant 0277 EIS Emission Pt(s) NA

Permission is hereby given by the Air Pollution Control District of Jefferson County to CONSTRUCT CONTROL equipment located at:

Medical Energy Generation Assocs of Ky Inc, 7100 Grade Ln, Lou, KY

in accordance with plans and specifications on file with the District and under the conditions stipulated on the reverse hereof.

Permit covers:

1 COMBINATION VENTURI & PACKED TOWER SCRUBBER SYSTEM mfg. by Anderson 2000 Inc. as follows: Model WAV-111 Wetted Approach Variable Throat Venturi, Model VES-111 Vertical Cyclonic Entrainment Separator, Model M-10.4 Packed Tower, & Model M-IV-19 Radial Blade Induced Draft Fan.

Max Permitted Cap 19,897 lbs/hr exhaust gas Permitted Oper Schedule 24x7x52 hr/yr

Fuels Used: Primary NA Secondary NA

Allowable Emissions	TSP	SO2	VOC	CO	NOx	HCl	Basis: % Rated Capacity	Max Permitted Oper Hrs/Yr
Lbs/Hr	2.30	____	____	____	____	1.13	100	
Tons/Yr	10.09	____	____	____	____	4.95	100	8760

Applicable Regulation(s) 5.12 & 7.07

Process Reference 1 Infectious Hospital Waste Incinerator. Permit #218-87.

Neither EMISSIONS OFFSET nor PSD applicable in the granting of this permit.

Emissions Bank Code Ref. _____ _____ _____ _____ _____

Bubble Reference _____ _____ _____ _____ _____

Applicant for Permit Philip W. Strauss

Title Managing Director Application Dated Sep 3, 1987

John C. McCarthy
Reviewing Engineer (03)

Howard M Rogers Jr
Air Pollution Control Officer

(02102-3327- 9272)

AIR POLLUTION CONTROL DISTRICT OF JEFFERSON COUNTY

914 East Broadway • Louisville, Kentucky 40204

CONDITIONAL CONSTRUCTION PERMIT

Permit No. 218-87 Effective Date Sep 30, 1989 Expiration Date Mar 30, 1990

Permit Fee $200.00 EIS Plant 0277 EIS Emission Pt(s) NA

Permission is hereby given by the Air Pollution Control District of Jefferson County to CONSTRUCT PROCESS equipment located at:

Medical Energy Generation Assocs of Ky Inc, 7100 Grade Ln, Lou, KY

in accordance with plans and specifications on file with the District and under the conditions stipulated on the reverse hereof.

Permit covers:

1 INFECTIOUS HOSPITAL WASTE INCINERATOR, Simonds Mfg. Corp., model no. AF-5B. Primary burner & secondary burner: Eclipse, model no. 248 MVTA, 4 MM BTU/hr each. Rated capacity: 1500 lbs/hr at 8500 BTU/lb or 1350 lbs/hr at 9350 BTU/lb.

Max Permitted Cap 1500 lbs/hr of waste Permitted Oper Schedule 24x7x52 hr/yr

Fuels Used: • Primary Natural gas Secondary NA

Allowable Emissions	TSP	SO2	VOC	CO	NOx	HCl	Basis: % Rated Capacity	Max Permitted Oper Hrs/Yr
Lbs/Hr	*					*	100	
Tons/Yr	*					*	100	8760

Applicable Regulation(s) 5.12 & 7.07

Control Reference 1 Combination Venturi & Packed Tower Scrubber. Permit #219-87.*

Neither EMISSIONS OFFSET nor PSD applicable in the granting of this permit.

Emissions Bank Code Ref. _____ _____ _____ _____ _____

Bubble Reference _____ _____ _____ _____ _____

Applicant for Permit Philip W. Strauss

Title Managing Director Application Dated Sep 3, 1987

John C. McCarthy
Reviewing Engineer (03)

Howard M Rogers Jr
Air Pollution Control Officer

Additional conditions applicable to this permit are attached hereto and made part hereof on pages 2 - 4. (02102-3327- 9272)

AIR POLLUTION CONTROL DISTRICT OF JEFFERSON COUNTY

Permit No. 218-87 EIS Plant 0277

ADDITIONAL CONDITIONS

This permit is issued under the following conditions:

1) The incinerator shall comply with the emission standards and nameplate requirement specified in District Regulation 7.07. (Standards of Performance for New Incinerators);

2) The incinerator shall comply with the provisions of District Regulation 5.12 (Standards of Performance for New or Modified Sources Emitting Toxic Air Pollutants);

3) All pollutants regulated under District Regulation 5.12 must have a minimum height of release of 66 feet above grade (including releases from the emergency vent) and shall not be emitted in an amount greater than 901 times the amount specified as M in Appendix B of 401 KAR 63:022. The District may approve different allowable emission rates for specific toxic air pollutants if dispersion modeling demonstrates that the threshold ambient limits specified in District Regulation 5.12 will not be exceeded;

4) Between 60 to 180 days after initial startup of the incinerator and at such other times as may be required by the District, the owner or operator of the incinerator shall conduct those performance tests specified by the District in accordance with District Regulation 1.04 and furnish the District a written report of the results of such performance tests. These tests shall include tests for particulates, hydrogen chloride, and various metals as a minimum. Other pollutants may require testing upon notice from the District;

5) The performance tests shall be conducted under such conditions as the District shall specify to the facility operator based upon representative performance of the incinerator and the control equipment. The owner or operator shall make available to the District such records as may be necessary to determine the conditions of the performance test(s);

6) The District shall be notified at least 30 days in advance of the projected starting date for any performance test;

7) The company shall comply with all requirements of the U.S. Nuclear Regulatory Commission. In addition to those requirements, the company shall not burn radioactive materials in the incinerator. This restriction includes low level radioactive wastes, such as depleted radioisotopes, but does not apply to regular wastes having normal background radiation;

(02102-0000- 9270)

8) Continuous emission monitors for oxygen and carbon monoxide shall be installed, calibrated, tested, and operated in accordance with District Regulation 7.01 and Appendix B of 40 CFR 60 (Code of Federal Regulations). The owner or operator shall develop and implement a quality assurance and quality control program for operating and maintaining the monitors. A program meeting the approval of the District shall be developed by September 30, 1990;

9) The incinerator shall be operated in such a manner that the carbon monoxide concentration in the exhaust gas from the incinerator (prior to the control equipment) does not exceed 100 parts per million;

10) During the operation of the incinerator, a minimum secondary chamber exit temperature of 1800 °F and a minimum secondary chamber residence time of 2 seconds shall be maintained. The firing of the incinerator shall be controlled automatically to maintain the minimum secondary chamber exit temperature;

11) During the operation of the incinerator, a minimum temperature of 1400 °F shall be maintained in the primary chamber. The firing of the incinerator shall be controlled automatically to maintain the minimum primary chamber temperature;

12) The incinerator shall be equipped with an automatic mechanical loading device, and an interlock system shall be provided to prevent charging unless the specified secondary chamber and primary chamber temperatures are being maintained;

13) The secondary chamber and the primary chamber temperatures shall be continuously monitored and recorded. The sensors shall be installed, maintained, and operated such that the flames from the burners do not impinge upon the sensors. The chamber temperatures shall be measured at or beyond the chamber exits. The temperature sensing devices shall have an accuracy that is ± 25 °F over its operating range. For the secondary chamber temperature, the digital recorder shall be connected to a strip chart recorder which has a minimum chart speed of one inch per hour. The time and date shall be recorded on the strip chart every eight hours;

14) Records shall be maintained at the source for a minimum of 2 years and shall be made available for review upon request;

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15) The owner or operator shall install, maintain, operate, calibrate, and audit a data logging and telemetry system which meets the following specifications: A polling time of no greater than 5 seconds and the ability to give instantaneous values, averages for the last 15-minute period, and 15-minute averages for the last 96 hours. The data logger with appropriate software and accessories must be compatible with the District's system. The owner or operator shall provide and pay for telephone access to its data logger so that the District may monitor and record the operating parameters necessary to determine proper operation. These parameters shall include the following: feed rate, average primary chamber exit temperature, average and minimum secondary chamber exit temperatures, average oxygen concentration after the secondary chamber, average and maximum carbon monoxide concentrations after the secondary chamber, and average and minimum pH values for the packed tower scrubbing solution;

16) During incinerator startup, the primary and secondary chambers must achieve and maintain the required minimum temperature for 15 minutes before charging begins;

17) During shutdowns, the secondary chamber minimum exit temperature of 1800 °F shall be maintained using auxiliary burners until the wastes are completely combusted and the burndown cycle is complete;

18) Operating procedures, startup procedures, shutdown procedures, and procedures to be followed if there are malfunctions with the incinerator or air pollution control equipment shall be approved by the District and shall be posted on-site at or near the incinerator;

19) If it is necessary to bypass the scrubber system, no additional waste shall be charged to the incinerator and the standard shutdown procedures shall be followed;

20) The pH of the scrubbing solution used in the packed tower scrubber shall be maintained in the range from 6.5 to 8.5. A continuous monitoring device with recorder shall be used to maintain a permanent record of the pH;

21) Inspection and maintenance schedules for the incinerator are to be posted or kept on-site at or near the incinerator;

22) Records shall be kept of inspections, maintenance, and repairs;

23) The incinerator and control equipment shall be built and operated according to plans submitted to the District with the permit application;

24) Excess liquids in the incinerator drain to a tank below the unit and are injected as a spray into the combustion zone. Liquids shall not be directly fed into this tank without the written approval of the District;

25) The incinerator loading rate shall not exceed 1500 lbs/hr.

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DIOXIN/FURAN EFs for Reference No. 8.,controlled with wet scrubber and cyclone.

		run 1	run 2	run 3
Charging Rate:	(lb/hr)	1309	1479	1619
Charging Rate:	(ton/hr)	0.6545	0.7395	0.8095

Type	Run #	Pollutant	Emission Rate (ng/sec)	Emission Rate (ng/hr)	Emission Rate (lb/hr)	Emission Factor (lb/ton)
2 a	1	2,3,7,8-TCDD	< 3.00E-03	1.08E+01	2.38E-11	3.63E-11
2 a	2	2,3,7,8-TCDD	< 6.00E-03	2.16E+01	4.75E-11	6.43E-11
2 a	3	2,3,7,8-TCDD	< 6.00E-03	2.16E+01	4.75E-11	5.87E-11
2 a	1	Other TCDD	1.90E-02	6.84E+01	1.50E-10	2.30E-10
2 a	2	Other TCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2 a	3	Other TCDD	3.30E-02	1.19E+02	2.61E-10	3.23E-10
2 a	1	Total TCDD	< 2.20E-02	7.92E+01	1.74E-10	2.66E-10
2 a	2	Total TCDD	6.00E-03	2.16E+01	4.75E-11	6.43E-11
2 a	3	Total TCDD	3.90E-02	1.40E+02	3.09E-10	3.82E-10
2 a	1	1,2,3,7,8-PeCDD	< 4.00E-03	1.44E+01	3.17E-11	4.84E-11
2 a	2	1,2,3,7,8-PeCDD	< 8.00E-03	2.88E+01	6.34E-11	8.57E-11
2 a	3	1,2,3,7,8-PeCDD	< 9.00E-03	3.24E+01	7.13E-11	8.81E-11
2 a	1	Other PeCDD	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2 a	2	Other PeCDD	8.30E-02	2.99E+02	6.57E-10	8.89E-10
2 a	3	Other PeCDD	5.60E-02	2.02E+02	4.44E-10	5.48E-10
2 a	1	Total PeCDD	4.00E-03	1.44E+01	3.17E-11	4.84E-11
2 a	2	Total PeCDD	9.10E-02	3.28E+02	7.21E-10	9.75E-10
2 a	3	Total PeCDD	6.50E-02	2.34E+02	5.15E-10	6.36E-10
2 a	1	1,2,3,4,7,8-HxCDD	< 5.00E-03	1.80E+01	3.96E-11	6.05E-11
2 a	2	1,2,3,4,7,8-HxCDD	< 1.00E-02	3.60E+01	7.92E-11	1.07E-10
2 a	3	1,2,3,4,7,8-HxCDD	< 1.00E-02	3.60E+01	7.92E-11	9.78E-11
2 a	1	1,2,3,6,7,8-HxCDD	< 5.00E-03	1.80E+01	3.96E-11	6.05E-11
2 a	2	1,2,3,6,7,8-HxCDD	< 1.00E-02	3.60E+01	7.92E-11	1.07E-10
2 a	3	1,2,3,6,7,8-HxCDD	< 1.20E-02	4.32E+01	9.50E-11	1.17E-10
2 a	1	1,2,3,7,8,9-HxCDD	< 5.00E-03	1.80E+01	3.96E-11	6.05E-11
2 a	2	1,2,3,7,8,9-HxCDD	< 1.20E-02	4.32E+01	9.50E-11	1.29E-10
2 a	3	1,2,3,7,8,9-HxCDD	< 1.30E-02	4.68E+01	1.03E-10	1.27E-10
2 a	1	Other HxCDD	7.00E-03	2.52E+01	5.54E-11	8.47E-11
2 a	2	Other HxCDD	7.90E-02	2.84E+02	6.26E-10	8.46E-10
2 a	3	Other HxCDD	9.90E-02	3.56E+02	7.84E-10	9.69E-10
2 a	1	Total HxCDD	2.20E-02	7.92E+01	1.74E-10	2.66E-10
2 a	2	Total HxCDD	1.11E-01	4.00E+02	8.79E-10	1.19E-09
2 a	3	Total HxCDD	1.34E-01	4.82E+02	1.06E-09	1.31E-09

2	a	1	1,2,3,4,6,7,8-HpCDD		1.07E-01	3.85E+02	8.47E-10	1.29E-09
2	a	2	1,2,3,4,6,7,8-HpCDD		1.17E-01	4.21E+02	9.27E-10	1.25E-09
2	a	3	1,2,3,4,6,7,8-HpCDD		6.60E-02	2.38E+02	5.23E-10	6.46E-10
2	a	1	Other HpCDD		8.50E-02	3.06E+02	6.73E-10	1.03E-09
2	a	2	Other HpCDD		1.61E-01	5.80E+02	1.28E-09	1.72E-09
2	a	3	Other HpCDD		0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	a	1	Total HpCDD		1.92E-01	6.91E+02	1.52E-09	2.32E-09
2	a	2	Total HpCDD		2.78E-01	1.00E+03	2.20E-09	2.98E-09
2	a	3	Total HpCDD		6.60E-02	2.38E+02	5.23E-10	6.46E-10
2	a	1	Total OCDD		0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	a	2	Total OCDD		0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	a	3	Total OCDD		0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	a	1	Total PCDD		3.28E-01	1.18E+03	2.60E-09	3.97E-09
2	a	2	Total PCDD		5.04E-01	1.81E+03	3.99E-09	5.40E-09
2	a	3	Total PCDD		3.29E-01	1.18E+03	2.61E-09	3.22E-09
2	a	1	2,3,7,8-TCDF		3.20E-02	1.15E+02	2.53E-10	3.87E-10
2	a	2	2,3,7,8-TCDF		6.20E-02	2.23E+02	4.91E-10	6.64E-10
2	a	3	2,3,7,8-TCDF		4.60E-02	1.66E+02	3.64E-10	4.50E-10
2	a	1	Other TCDF		1.20E+00	4.33E+03	9.52E-09	1.45E-08
2	a	2	Other TCDF		2.26E+00	8.14E+03	1.79E-08	2.42E-08
2	a	3	Other TCDF		1.32E+00	4.75E+03	1.05E-08	1.29E-08
2	a	1	Total TCDF	<	1.23E+00	4.44E+03	9.77E-09	1.49E-08
2	a	2	Total TCDF		2.32E+00	8.36E+03	1.84E-08	2.49E-08
2	a	3	Total TCDF		1.37E+00	4.92E+03	1.08E-08	1.34E-08
2	a	1	1,2,3,7,8-PeCDF	<	3.00E-03	1.08E+01	2.38E-11	3.63E-11
2	a	2	1,2,3,7,8-PeCDF		7.90E-02	2.84E+02	6.26E-10	8.46E-10
2	a	3	1,2,3,7,8-PeCDF		6.10E-02	2.20E+02	4.83E-10	5.97E-10
2	a	1	2,3,4,7,8-PeCDF	<	3.00E-03	1.08E+01	2.38E-11	3.63E-11
2	a	2	2,3,4,7,8-PeCDF		1.26E-01	4.54E+02	9.98E-10	1.35E-09
2	a	3	2,3,4,7,8-PeCDF	<	4.00E-03	1.44E+01	3.17E-11	3.91E-11
2	a	1	Other PeCDF		2.68E-01	9.65E+02	2.12E-09	3.24E-09
2	a	2	Other PeCDF		8.57E-01	3.09E+03	6.79E-09	9.18E-09
2	a	3	Other PeCDF		3.29E-01	1.18E+03	2.61E-09	3.22E-09
2	a	1	Total PeCDF		2.74E-01	9.86E+02	2.17E-09	3.32E-09
2	a	2	Total PeCDF		1.06E+00	3.82E+03	8.41E-09	1.14E-08
2	a	3	Total PeCDF		3.94E-01	1.42E+03	3.12E-09	3.85E-09
2	a	1	1,2,3,4,7,8-HxCDF		6.60E-02	2.38E+02	5.23E-10	7.99E-10
2	a	2	1,2,3,4,7,8-HxCDF		1.40E-01	5.04E+02	1.11E-09	1.50E-09
2	a	3	1,2,3,4,7,8-HxCDF		9.50E-02	3.42E+02	7.52E-10	9.29E-10
2	a	1	1,2,3,6,7,8-HxCDF	<	3.00E-03	1.08E+01	2.38E-11	3.63E-11

2	a	2	1,2,3,6,7,8-HxCDF		7.90E-02	2.84E+02	6.26E-10	8.46E-10
2	a	3	1,2,3,6,7,8-HxCDF	<	4.00E-03	1.44E+01	3.17E-11	3.91E-11
2	a	1	2,3,4,6,7,8-HxCDF		4.90E-02	1.76E+02	3.88E-10	5.93E-10
2	a	2	2,3,4,6,7,8-HxCDF		7.40E-02	2.66E+02	5.86E-10	7.93E-10
2	a	3	2,3,4,6,7,8-HxCDF		7.90E-02	2.84E+02	6.26E-10	7.73E-10
2	a	1	1,2,3,7,8,9-HxCDF	<	6.00E-03	2.16E+01	4.75E-11	7.26E-11
2	a	2	1,2,3,7,8,9-HxCDF	<	1.10E-02	3.96E+01	8.71E-11	1.18E-10
2	a	3	1,2,3,7,8,9-HxCDF	<	7.00E-03	2.52E+01	5.54E-11	6.85E-11
2	a	1	Other HxCDF		1.80E-01	6.48E+02	1.43E-09	2.18E-09
2	a	2	Other HxCDF		4.03E-01	1.45E+03	3.19E-09	4.32E-09
2	a	3	Other HxCDF		2.29E-01	8.24E+02	1.81E-09	2.24E-09
2	a	1	Total HxCDF		3.04E-01	1.09E+03	2.41E-09	3.68E-09
2	a	2	Total HxCDF		7.07E-01	2.55E+03	5.60E-09	7.57E-09
2	a	3	Total HxCDF		4.14E-01	1.49E+03	3.28E-09	4.05E-09
2	a	1	1,2,3,4,6,7,8-HpCDF		9.70E-02	3.49E+02	7.68E-10	1.17E-09
2	a	2	1,2,3,4,6,7,8-HpCDF		1.75E-01	6.30E+02	1.39E-09	1.87E-09
2	a	3	1,2,3,4,6,7,8-HpCDF	<	5.00E-03	1.80E+01	3.96E-11	4.89E-11
2	a	1	1,2,3,4,7,8,9-HpCDF	<	9.00E-03	3.24E+01	7.13E-11	1.09E-10
2	a	2	1,2,3,4,7,8,9-HpCDF	<	1.70E-02	6.12E+01	1.35E-10	1.82E-10
2	a	3	1,2,3,4,7,8,9-HpCDF	<	2.10E-02	7.56E+01	1.66E-10	2.05E-10
2	a	1	Other HpCDF		8.70E-02	3.13E+02	6.89E-10	1.05E-09
2	a	2	Other HpCDF		1.02E-01	3.67E+02	8.08E-10	1.09E-09
2	a	3	Other HpCDF		0.00E+00	0.00E+00	0.00E+00	0.00E+00
2	a	1	Total HpCDF		1.93E-01	6.95E+02	1.53E-09	2.34E-09
2	a	2	Total HpCDF		2.94E-01	1.06E+03	2.33E-09	3.15E-09
2	a	3	Total HpCDF		2.60E-02	9.36E+01	2.06E-10	2.54E-10
2	a	1	Total OCDF	<	1.20E-02	4.32E+01	9.50E-11	1.45E-10
2	a	2	Total OCDF	<	1.80E-02	6.48E+01	1.43E-10	1.93E-10
2	a	3	Total OCDF		1.16E-01	4.18E+02	9.19E-10	1.13E-09
2	a	1	Total PCDF		2.02E+00	7.26E+03	1.60E-08	2.44E-08
2	a	2	Total PCDF		4.40E+00	1.59E+04	3.49E-08	4.72E-08
2	a	3	Total PCDF		2.31E+00	8.33E+03	1.83E-08	2.26E-08

a Incinerator is equipped with a wet scrubber and a cyclone.

b The compound was not detected in three runs and it might not be appropriate to develop an emission factor.

Metals EFs for Reference No. 8.,controlled with wet scrubber and cyclone.

	run 1	run 2	run 3
Charging Rate: (lb/hr)	1480	1440	1160
Charging Rate: (ton/hr)	0.74	0.72	0.58

Type	Run #	Pollutant	Emission Rate (g/hr)	Emission Rate (lb/hr)	Emission Factor (lb/ton)
2 a	1	Arsenic	0.01	2.20E-05	2.97E-05
2 a	2	Arsenic	0.01	2.20E-05	3.06E-05
2 a	3	Arsenic	0.01	2.20E-05	3.79E-05
2 a	1	Cadmium	0.91	2.00E-03	2.71E-03
2 a	2	Cadmium	0.76	1.67E-03	2.32E-03
2 a	3	Cadmium	3.3	7.26E-03	1.25E-02
2 a	1	Chromium	0.86	1.89E-03	2.56E-03
2 a	2	Chromium	0.44	9.68E-04	1.34E-03
2 a	3	Chromium	0.52	1.14E-03	1.97E-03
2 a	1	Lead	39	8.58E-02	1.16E-01
2 a	2	Lead	34	7.48E-02	1.04E-01
2 a	3	Lead	40	8.80E-02	1.52E-01
2 a	1	Mercury	1.4	3.08E-03	4.16E-03
2 a	2	Mercury	3.1	6.82E-03	9.47E-03
2 a	3	Mercury	1.5	3.30E-03	5.69E-03
2 a	1	Nickel	0.49	1.08E-03	1.46E-03
2 a	2	Nickel	0.65	1.43E-03	1.99E-03
2 a	3	Nickel	1.1	2.42E-03	4.17E-03
2 a	1	Silver	0.05	1.10E-04	1.49E-04
2 a	2	Silver	0.24	5.28E-04	7.33E-04
2 a	3	Silver	0.11	2.42E-04	4.17E-04

a Incinerator is equipped with a wet scrubber and a cyclone.