Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

TEST REPORT
FOR
SWEDISH AMERICAN HOSPITAL
CONSUMAT INCINERATOR

DECEMBER 17, 1986

B-5021-16AP

Beling Consultants

DISCUSSION

A sampling program to determine the level of particulate and carbon monoxide emission was performed on December 17, 1986 on the hospital's new Consumat Incinerator. The incinerator is a Model C75P with serial number of 4806. It is rated as a type 7 with a capacity of 175 pounds/hour.

The unit was charged at 175 lbs/hr for tests #1 and #3. Test #2, the rate was 172 lbs/hr.

The unit was loaded one time for these tests.

Pre-test orsats were done with all the burners operating and with the bottom burners off.

The unit was operated during this series with the bottom burners off.

BTU usage was recorded for all tests. The carbon monoxide was measured by indicator tube and infrared analysis.

There were not any mechanical problems with the unit during the tests.

PARTICULATE FIELD DATA

-ANT: SWEDISH AMERICAN HOSPITAL
SOURCE: CONSUMAT INCINERATOR
PROCESS WEIGHT RATE: 175 LBS/HR
SAMPLE LOCATION: STACK
OPERATOR LT-RS
DAY/DATE WED.-12/17/86

IMP. BOX NO. = 1
PITOT CP = 0.83
EST. TM (DEG.F) = 60.00
STATIC DUCT PRES. (IN.HG) = 29.34
C-FACTOR = 0.98
NOZZLE DIA. (IN.) = 0.507
AMBIENT TEMP. (DEG.F) = 37.0
FILTER WT. (MG) = 625.58

MIN./POINT = 5

BAR. PRES. (IN.HG) = 29.35
METER DELTA HA (IN.H2O) = 1.80
EST. % MOISTURE = 6.
PS/P = 1.000
EST. TS (DEG.F) = 550.00
REF. DELTA PRES. (IN.H2O) = 0.05
STACK X-SEC. AREA (SQ.FT) = 2.46
PARTIC. WT. (UNCORR. MG) = 138.32
ACETONE BLANK (MG) = 2.00
WATER BLANK (MG) = 0.00
LEAK TESTS: BEFORE = .00
AFTER = .02

TEST NO. 1

PUMP VACUUM I.HG)	POINT NO.	CLOCK TIME	STACK TEMP. (DEG.F)	DRY GAS METER (CU.FT.)	PITOT DELTA P (IN.H2O)	ORIFICE DELTA H (IN.H2O)	DRY GAS TEMP. (DEG.F) INLET	DRY GAS TEMP. (DEG.F) OUTLET
0.50	1	0.0	530.0	290.02	0.0400	1.35	76.0	58.0
0.50	2	5.0	538.0	293.40	0.0450	1.50	76.0	58.0
0.50	3	10.0	536.0	296.90	0.0500	1.70	74.0	60.0
0.50	4	15.0	533.0	300.60	0.0400	1.35	74.0	58.0
0.50	5	20.0	536.0	304.15	0.0400	1.35	72.0	58.0
0.50	6	25.0	528.0	307.35	0.0300	1.02	70.0	57.0
0.50	7	30.0	540.0	310.20	0.0400	1.35	62.0	56.0
0.50	8	35.0	547.0	313.80	0.0450	1.50	67.0	57.0
0.50	9	40.0	580.0	317.40	0.0450	1.50	70.0	56.0
0.50	10	45.0	618.0	321.00	0.0500	1.70	68.0	56.0
0.50	11	50.0	611.0	324.70	0.0400	1.35	68.0	57.0
0.50	12	55.0	605.0	328.00	0.0400	1.35	68.0	57.0
		60		331.37				
OTAL			6702.0	41.35	0.5050	17.02	845.0	688.0
VERAGE			558.5		0.0421	1.42	70.4	57.3

PARTICULATE FIELD DATA

_ANT: SWEDISH AMERICAN HOSPITAL
SOURCE: CONSUMAT INCINERATOR
PROCESS WEIGHT RATE: 172 LBS/HR
SAMPLE LOCATION: STACK
OPERATOR LT-RS
DAY/DATE WED.-12/17/86

IMP. BOX NO. = 2
PITOT CP = 0.83
EST. TM (DEG.F) = 60.00
STATIC DUCT PRES. (IN.HG) = 29.37
C-FACTOR = 0.98
NOZZLE DIA. (IN.) = 0.507
AMBIENT TEMP. (DEG.F) = 38.0
FILTER WT. (MG) = 628.05

MIN./POINT = 5

BAR. PRES. (IN.HG) = 29.38
METER DELTA HA (IN.H2O) = 1.80
EST. % MOISTURE = 6.
PS/P = 1.000
EST. TS (DEG.F) = 600.00
REF. DELTA PRES. (IN.H2O) = 0.05
STACK X-SEC. AREA (SQ.FT) = 2.46
PARTIC. WT. (UNCORR. MG) = 36.84
ACETONE BLANK (MG) = 1.93
WATER BLANK (MG) = 0.00
LEAK TESTS: BEFORE = .01
AFTER = .01

TEST NO. 2

PUMP VACUUM (IN.HG)	POINT NO.	CLOCK TIME	STACK TEMP. (DEG.F)	DRY GAS METER (CU.FT.)	PITOT DELTA P (IN.H2O)	ORIFICE DELTA H (IN.H2O)	DRY GAS TEMP. (DEG.F) INLET	DRY GAS TEMP. (DEG.F) OUTLET
0.50	1	0.0	570.0	407.10	0.0450	1.45	72.0	56.0
0.50	2	5.0	608.0	410.60	0.0500	1.60	70.0	56.0
0.50	3	10.0	600.0	414.25	0.0600	1.95	74.0	57.0
0.50	4	15.0	597.0	418.19	0.0450	1.45	76.0	56.0
0.50	5	20.0	594.0	421.65	0.0500	1.60	74.0	56.0
0.50	6	25.0	583.0	425.40	0.0450	1.45	74.0	56.0
0.50	7	30.0	621.0	428.60	0.0400	1.30	60.0	52.0
0.50	8	35.0	619.0	432.05	0.0400	1.30	62.0	52.0
0.50	9	40.0	612.0	435.45	0.0400	1.30	64.0	52.0
0.50	10	45.0	613.0	438.80	0.0450	1.45	65.0	52.0
0.50	11	50.0	614.0	442.20	0.0400	1.30	66.0	52.0
0.50	12	55.0	613.0	445.50	0.0300	1.15	68.0	52.0
		60		448.55				
OTAL			7244.0	41.45	0.5300	17.30	825.0	649.0
VERAGE			603.7		0.0442	1.44	68.8	54.1

PARTICULATE FIELD DATA

LANT:
SOURCE: SWEDISH AMERICAN HOSPITAL
PROCESS WEIGHT RATE: CONSUMAT INCINERATOR
SAMPLE LOCATION: 175 LBS/HR
OPERATOR STACK
DAY/DATE LT-RS
WED.-12/17/86

IMP. BOX NO. = 3
PITOT CP = 0.83
EST. TM (DEG.F) = 60.00
STATIC DUCT PRES. (IN.HG) = 29.38
C-FACTOR = 0.98
NOZZLE DIA. (IN.) = 0.507
AMBIENT TEMP. (DEG.F) = 40.0
FILTER WT. (MG) = 624.03

MIN./POINT = 5

BAR. PRES. (IN.HG) = 29.40
METER DELTA HA (IN.H2O) = 1.80
EST. % MOISTURE = 6.
PS/P = 1.000
EST. TS (DEG.F) = 600.00
REF. DELTA PRES. (IN.H2O) = 0.06
STACK X-SEC. AREA (SQ.FT) = 2.46
PARTIC. WT. (UNCORR. MG) = 97.23
ACETONE BLANK (MG) = 2.32
WATER BLANK (MG) = 0.00
LEAK TESTS: BEFORE = .00
AFTER = .02

EST NO. 3

UMP ACUUM N.HG)	POINT NO.	CLOCK TIME	STACK TEMP. (DEG.F)	DRY GAS METER (CU.FT.)	PITOT DELTA P (IN.H2O)	ORIFICE DELTA H (IN.H2O)	DRY GAS TEMP. (DEG.F) INLET	DRY GAS TEMP. (DEG.F) OUTLET
0.50	1	0.0	615.0	450.10	0.0500	1.60	42.0	40.0
0.50	2	5.0	700.0	453.95	0.0500	1.52	52.0	42.0
0.50	3	10.0	683.0	457.20	0.0550	1.70	54.0	42.0
0.50	4	15.0	672.0	461.10	0.0500	1.52	60.0	44.0
0.50	5	20.0	663.0	464.40	0.0500	1.52	60.0	44.0
.50	6	25.0	659.0	467.48	0.0400	1.25	60.0	46.0
.50	7	30.0	634.0	470.72	0.0500	1.52	56.0	46.0
.50	8	35.0	644.0	474.30	0.0600	1.80	62.0	47.0
.50	9	40.0	634.0	478.10	0.0600	1.80	62.0	47.0
.50	10	45.0	625.0	481.90	0.0500	1.60	62.0	47.0
.50	11	50.0	582.0	485.45	0.0400	1.35	64.0	48.0
.50	12	55.0	583.0	488.67	0.0350	1.12	60.0	50.0
		60		491.69				
TAL			7694.0	41.59	0.5900	18.30	694.0	543.0
ERAGE			641.2		0.0492	1.53	57.8	45.3

BELING CONSULTANTS INC

ROJECT: SWEDISH AMERICAN HOSPITAL
STACK LOCATION: STACK

TEST NO: 1
DATE: 12/17/86
TIME: 9:51 AM-10:55 AM

TEST DATA:

SAMPLE TIME (MINUTES)	60
AVERAGE STACK TEMPERATURE (DEG.F)	558.50
AVERAGE METER TEMPERATURE (DEG.F)	63.87
BAROMETRIC PRESSURE (IN.HG), PBAR	29.35
STACK PRESSURE (IN.HG), PS	29.34
STACK CROSS-SEC. AREA (SQ.FT), A	2.46
NOZZLE CROSS-SEC. AREA (SQ.FT), AN	0.0014019
PITOT COEFFICIENT, CP	0.83
AVERAGE SQRT(DELTA P)	0.20
AVERAGE DELTA H (IN.H2O)	1.41
METERED GAS VOLUME (CU.FT.), VM	41.35
MOISTURE COLLECTED (ML), VLC	55.00
PARTICULATE SUMMARY:	
PARTICULATE PRIOR TO FILTER (MG)	129.19
PARTICULATE ON FILTER (MG)	9.13
PARTICULATE ORGANIC CONDENSIBLES (MG)	0.00
PARTICULATE INORGANIC CONDENSIBLES (MG)	0.00
UNCORRECTED PARTICULATE TOTAL (MG)	138.32
CORRECTION FOR BLANKS (MG)	2.00
CORRECTED PARTICULATE TOTAL (MG)	136.32

CALCULATED DATA:

AVERAGE FLUE GAS TEMPERATURE (DEG.R), TS	1018.50
AVERAGE METER TEMPERATURE (DEG.R), TM	523.87
METERED GAS VOLUME (SCF), VMSTD	41.17
VOLUME OF WATER VAPOR (CU.FT.), VWSTD	2.60
MOISTURE CONTENT (%), BWO	5.95
DRY MOLECULAR WT. OF GAS (LB/LB-MOLE), MD	29.25
WET MOLECULAR WT. OF GAS (LB/LB-MOLE), MS	28.58
STACK GAS VELOCITY (FPS), VS	16.00
VOLUMETRIC FLOW RATE (CFM), QS	68029.
CONCENTRATION (GR./SCF), C"S	0.0509
PARTICULATE MASS RATE (LB/HR), PMRS	0.51
ISOKINETIC VARIATION (%), I	106.22

BELING CONSULTANTS INC

PROJECT: SWEDISH AMERICAN HOSPITAL
STACK LOCATION: STACK

TEST NO: 2
DATE: 12/17/86
TIME: 11:55 AM-1:00 PM

TEST DATA:

SAMPLE TIME (MINUTES)	60
AVERAGE STACK TEMPERATURE (DEG.F)	603.66
AVERAGE METER TEMPERATURE (DEG.F)	61.41
BAROMETRIC PRESSURE (IN.HG), PBAR	29.38
STACK PRESSURE (IN.HG), PS	29.37
STACK CROSS-SEC. AREA (SQ.FT), A	2.46
NOZZLE CROSS-SEC. AREA (SQ.FT), AN	0.0014019
PITOT COEFFICIENT, CP	0.83
AVERAGE SQRT(DELTA P)	0.20
AVERAGE DELTA H (IN.H2O)	1.44
METERED GAS VOLUME (CU.FT.), VM	41.45
MOISTURE COLLECTED (ML), VLC	34.00
PARTICULATE SUMMARY:	
PARTICULATE PRIOR TO FILTER (MG)	27.97
PARTICULATE ON FILTER (MG)	8.87
PARTICULATE ORGANIC CONDENSIBLES (MG)	0.00
PARTICULATE INORGANIC CONDENSIBLES (MG)	0.00
UNCORRECTED PARTICULATE TOTAL (MG)	36.84
CORRECTION FOR BLANKS (MG)	1.93
CORRECTED PARTICULATE TOTAL (MG)	34.91

CALCULATED DATA:

AVERAGE FLUE GAS TEMPERATURE (DEG.R), TS	1063.66
AVERAGE METER TEMPERATURE (DEG.R), TM	521.41
METERED GAS VOLUME (SCF), VMSTD	41.51
VOLUME OF WATER VAPOR (CU.FT.), VWSTD	2.55
MOISTURE CONTENT (%), BWO	5.80
DRY MOLECULAR WT. OF GAS (LB/LB-MOLE), MD	29.25
WET MOLECULAR WT. OF GAS (LB/LB-MOLE), MS	28.60
STACK GAS VELOCITY (FPS), VS	16.72
VOLUMETRIC FLOW RATE (CFM), QS	68237.
CONCENTRATION (GR./SCF), C"S	0.0129
PARTICULATE MASS RATE (LG/HR), PMRS	0.13
ISOKINETIC VARIATION (%), I	106.77

BELING CONSULTANTS INC

ROJECT: SWEDISH AMERICAN HOSPITAL
STACK LOCATION: STACK

TEST NO: 3
DATE: 12/17/86
TIME: 1:45 PM-2:48 PM

TEST DATA:

SAMPLE TIME (MINUTES)	60
AVERAGE STACK TEMPERATURE (DEG.F)	641.16
AVERAGE METER TEMPERATURE (DEG.F)	51.54
BAROMETRIC PRESSURE (IN.HG), PBAR	29.40
STACK PRESSURE (IN.HG), PS	29.38
STACK CROSS-SEC. AREA (SQ.FT), A	2.46
NOZZLE CROSS-SEC. AREA (SQ.FT), AN	0.0014019
PITOT COEFFICIENT, CP	0.83
AVERAGE SQRT(DELTA P)	0.22
AVERAGE DELTA H (IN.H2O)	1.52
METERED GAS VOLUME (CU.FT.), VM	41.59
MOISTURE COLLECTED (ML), VLC	57.50
PARTICULATE SUMMARY:	
PARTICULATE PRIOR TO FILTER (MG)	71.26
PARTICULATE ON FILTER (MG)	25.99
PARTICULATE ORGANIC CONDENSIBLES (MG)	0.00
PARTICULATE INORGANIC CONDENSIBLES (MG)	0.00
UNCORRECTED PARTICULATE TOTAL (MG)	97.25
CORRECTION FOR BLANKS (MG)	2.32
CORRECTED PARTICULATE TOTAL (MG)	94.93

CALCULATED DATA:

AVERAGE FLUE GAS TEMPERATURE (DEG.R), TS	1101.16
AVERAGE METER TEMPERATURE (DEG.R), TM	511.54
METERED GAS VOLUME (SCF), VMSTD	42.49
VOLUME OF WATER VAPOR (CU.FT.), VWSTD	2.72
MOISTURE CONTENT (%), BWO	6.02
DRY MOLECULAR WT. OF GAS (LB/LB-MOLE), MD	29.30
WET MOLECULAR WT. OF GAS (LB/LB-MOLE), MS	28.62
STACK GAS VELOCITY (FPS), VS	17.95
VOLUMETRIC FLOW RATE (CFH), QS	70602.
CONCENTRATION (GR./SCF), C"S	0.0344
PARTICULATE MASS RATE (LB/HR), PMRS	0.35
ISOKINETIC VARIATION (%), I	105.63

SWEDISH AMERICAN HOSPITAL

CARBON MONOXIDE TEST DATA

Test No.	Infrared Tests Absorbance	Time CDST	CO_2%	O_2%	N_2%	Infrared CO PPM	Indicator Tube CO PPM	Excess Air Ratio	CO Corrected to 50% Excess Air, PPM
1A:	0.004	9:51 am	3.5	17.4	79.1	5.0	5.0	4.78	0.0
1B	0.004	-------	3.5	17.4	79.1	5.0	5.0	4.78	0.0
1C	0.004	10:51 am				5.0	5.0	4.78	0.0
2A	0.000	11:55 am	3.6	17.0	79.4	0.0	0.0	---	19.0
2B	0.000	-------	3.6	17.0	17.9	0.0	0.0	---	19.0
2C	0.000	1:00 pm				0.0	0.0	---	19.0

Average carbon monoxide concentration 10.0 PPM.

COMPUTATION SHEET
Beling Consultants
PROFESSIONAL ENGINEERS

MOLINE, IL BURLINGTON, IA PEORIA, IL BETTENDORF, IA ROCKFORD, IL AURORA, CO JOLIET, IL

BY L. Thomsen DATE 12/18/86	PROJECT	JOB NO.
CHK'D BY DATE	HCI Testing	SHEET NO. OF SHEETS

The samples were collected in dilute sodium hydroxide solution in a Method Five sampling train. The sample length was thirty minutes with the sampling rate at approximately 0.5 CFM. The analysis was done by titration for total chlorides. The unit was charged at one half of its hourly capacity.

175/2 = 87½ #/hr

HCl EMISSION DATA

Run No.	4	5
Date	12/17/86	12/17/86
mg/HCl	119	147
T_m - Average Gas Meter Temperature, °F	50.6	51.3
P_b - Barometric Pressure, "Hg abs.	29.38	29.38
V_m - Volume of dry gas sampled @ meter conditions, ft^3	15.87	19.4
ppm: HCl	172	174

$$\text{ppm HCl} = \frac{1.32 \times \text{mg HCl} \times (T_m + 460)}{V_m \times P_b}$$

TEST 4

$$\text{ppm HCl} = \frac{1.32 \times 119 \text{ mg} \times 510.6}{15.87 \times 29.38} = 172 \text{ ppm}$$

TEST 5

$$\text{ppm HCl} = \frac{1.32 \times 147 \text{ mg} \times 511.3}{19.4 \times 29.38} = 174 \text{ ppm}$$

COMPUTATION SHEET
Beling Consultants
PROFESSIONAL ENGINEERS

MOLINE, IL · PEORIA, IL · ROCKFORD, IL · JOLIET, IL · BURLINGTON, IA · BETTENDORF, IA · AURORA, CO

BY L. Thomsen DATE 12/18/86	PROJECT	JOB NO.
CHK'D BY DATE	Incinerator	SHEET NO. OF SHEETS

Test 4

$$M_{HCl} = 5.76 \times 10^{-6} (172)(1057.24)$$
$$= 1.05 \text{ lbs/hr}$$

Test 5

$$M_{HCl} = 5.76 \times 10^{-6} (174)(1131.27)$$
$$= 1.13 \text{ lbs/hr}$$