STAPPA/ALAPCO 2.5 #108 10/28/86 BR 2.2 (#55) Bill MacC 40

**American Services Associates**
Consultants in Air, Water, Energy, Hygiene & Management

RECEIVED MAY 29 1984 ENVIRONMENTAL CONSERVATION REGION II

COPY

May 24, 1984

Mr. J. Kris Warren
ANCHORAGE WATER & WASTEWATER UTILITY
P.O. Box 6285
Anchorage, Alaska 99502-2085

Dear Kris,

dup. Ck w/ Ref #30 to see if new info

Re: Clarifications-4/84 Pt Woronzof Sludge Incinerator Test

Our conference call conversation with Bill MacClarence Department of Environmental Conservation (ADEC) brought clarification of the following elements on the subject report that the subject report requires these clarification comments
1. How the atmospheric emissions were corrected to a concentration of 12% less the contribution from auxiliary fuel (i.e. natural gas in the case of Pt. Woronzof Sewage Sludge Incinerator).
2. How the flowrate of shaft cooling air was determined.
3. How to determine if carbon dioxide is being absorbed in the scrubber which thereby increases the reported particulate emissions.

Particulate Emission Corrections to 12% Carbon Dioxide

Particulate emissions on combustion sources can be diluted with air to meet emission standards based upon concentration bases. The correction to 12% carbon dioxide was developed to prevent air dilution as a means to get combustion sources to dilute with ambient air as a means to meet the particulate emission standard (i.e. "Dilution is NOT the Solution to Pollution").

The correction of particulate emissions from combustion sources to 12% carbon dioxide is based upon burning bituminous coal with 50% more air than is required for theoretically perfect combustion (Theoretically perfect burning of bituminous coal will produce 18% carbon dioxide in the exhaust gas). At the time the 12% carbon dioxide standard was developed, 50% excess air was an acceptable quantity of excess air to satisfactorily burn bituminous coal. The particulate emissions from conmbustion sources are measured and no correction is made if the carbon dioxide in the exhaust stack is 12%. If the exhaust gas concentration of the stack is 6% carbon dioxide, the combustion source burning bituminous coal is diluting with air (i.e. 100% excess air) so the particulate emissions are "corrected" to 12% carbon dioxide by a factor (i.e. 12/measured % carbon dioxide in the exhaust gas stack) to correct the exhaust gas back to 12% carbon dioxide and 50% excess air.

Combustion sources burn with supplemental fuel (i.e. auxiliary fuel) to perform special operations such as ignite the material being burned, raise the temperature in an afterburner to maintain a high temperature for combustion to be completed, evaporate water so the material will burn. The auxiliary fuel contributes carbon dioxide to the exhaust gas. Because the auxiliary fuel used in afterburners or in the burners of incinerators is assumed to burn efficiently and completely but contributes carbon dioxide to the exhaust gases, the quantity of carbon dioxide in the exhaust gases must be known and

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with the two equations listed below, the quantity of dilution air was determined.

EQ 1. Incin Air + Dil Air = Stack Air = I + D = 5012 dscfm

EQ 2, Incin O2 + Dil O2 = Stack O2 = (0.1588)(5012) = 795.9

(I)(0.1365) + (D)(0.21) = 795.9 with D = 5012 - I

Therefore, D = 1521 dscfm

The effect of dilution air on the emissions is accounted for in the correction to 12% carbon dioxide. Therefore the dilution air was not utilized to calculate an adjusted particulate emission concentration.

Carbon Dioxide Scrubber Absorption Effects on Emissions

Carbon dioxide can be absorbed in scrubber water which reduces the measured carbon dioxide concentration at the stack and therefore the 12% carbon dioxide correction factor is larger and the calculated particulate emission is larger. Mr. MacClarence of ADEC provided a reference (i.e. Reference No. 2 enclosed) to account for the absorption of carbon dioxide by the scrubber. Airflow and carbon dioxide before the scrubber were not measured on this project and because the particulate emissions were exceptionally low, the calculation of an adjusted carbon dioxide concentration was not performed. Mr. MacClarences' interest in accuracy in particulate emission concentration and opacity is to be commended in finding and providing the enclosed Reference No.2. The measurement of carbon dioxide will be made simultaneously at the scrubber inlet and the stack on the next particulate emission sample to determine the significance of the scrubber absorption of carbn dioxide.

The above observations have been made to clarify the subject report. I apologize that the subject report was not clear enough for the layman to understand and will endeavor to make future reports more clear. What specific report improvements would make the subject report more clear to the layman?

Yours truly,
AMERICAN SERVICES ASSOCIATES
dba ASA CONSULTANTS

Wesley D. Snowden, P.E.

enclosures:

cc: Mr. Bill MacClarence
ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
437 E Street
Anchorage, Alaska 99501

(3) The minimum data requirements have or have not been met; or, the minimum data requirements have not been met for errors that were unavoidable.

(4) Compliance with the standards has or has not been achieved during the reporting period.

(h) For the purposes of the reports required under § 60.7, periods of excess emissions are defined as all 6-minute periods during which the average opacity exceeds the applicable opacity standards under § 60.42a(b). Opacity levels in excess of the applicable opacity standard and the date of such excesses are to be submitted to the Administrator each calendar quarter.

(i) The owner or operator of an affected facility shall submit the written reports required under this section and subpart A to the Administrator for every calendar quarter. All quarterly reports shall be postmarked by the 30th day following the end of each calendar quarter.

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414).)

## Subpart E—Standards of Performance for Incinerators

### § 60.50 Applicability and designation of affected facility.

[42 FR 37936, July 25, 1977]

(a) The provisions of this subpart are applicable to each incinerator of more than 45 metric tons per day charging rate (50 tons/day), which is the affected facility.

(b) Any facility under paragraph (a) of this section that commences construction or modification after August 17, 1971, is subject to the requirements of this subpart.

### § 60.51 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in Subpart A of this part.

(a) "Incinerator" means any furnace used in the process of burning solid waste for the purpose of reducing the volume of the waste by removing combustible matter.

(b) "Solid waste" means refuse, more than 50 percent of which is municipal type waste consisting of a mixture of paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustibles, and noncombustible materials such as glass and rock.

(c) "Day" means 24 hours.

### § 60.52 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this part shall cause to be discharged into the atmosphere from any affected facility any gases which contain particulate matter in excess of 0.18 g/dscm (0.08 gr/dscf) corrected to 12 percent $CO_2$.

[39 FR 20790, June 14, 1974]

### § 60.53 Monitoring of operations.

(a) The owner or operator of any incinerator subject to the provisions of this part shall record the daily charging rates and hours of operation.

[39 FR 20790, June 14, 1974]

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414).)

### § 60.54 Test methods and procedures.

(a) The reference methods in Appendix A to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standard prescribed in § 60.52 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content;

(2) Method 1 for sample and velocity traverses;

(3) Method 2 for velocity and volumetric flow rate; and

(4) Method 3 for gas analysis and calculation of excess air, using the integrated sample technique.

(b) For Method 5, the sampling time for each run shall be at least 60 minutes and the minimum sample volume shall be 0.85 dscm (30.0 dscf) except that smaller sampling times or sample volumes, when necessitated by process variables or other factors, may be approved by the Administrator.

(c) **If a wet scrubber is used, the gas analysis sample shall reflect flue gas conditions after the scrubber, allowing for carbon dioxide absorption by sampling the gas on the scrubber inlet and outlet sides according to either the procedure under paragraphs (c)(1) through (c)(5) of this section or the procedure under paragraphs (c)(1), (c)(2) and (c)(6) of this section as follows:**

(1) The outlet sampling site shall be the same as for the particulate matter measurement. The inlet site shall be selected according to Method 1, or as specified by the Administrator.

(2) Randomly select 9 sampling points within the cross-section at both the inlet and outlet sampling sites. Use the first set of three for the first run, the second set for the second run, and the third set for the third run.

(3) Simultaneously with each particulate matter run, extract and analyze for $CO_2$ an integrated gas sample according to Method 3, traversing the three sample points and sampling at each point for equal increments of time. Conduct the runs at both inlet and outlet sampling sites.

(4) Measure the volumetric flow rate at the inlet during each particulate matter run according to Method 2, using the full number of traverse points. For the inlet make two full velocity traverses approximately one hour apart during each run and average the results. The outlet volumetric flow rate may be determined from the particulate matter run (Method 5).

(5) Calculate the adjusted $CO_2$ percentage using the following equation:

$$(\% CO_2)_{adj} = (\% CO_2)_{di} (Q_{di}/Q_{do})$$

where:

$(\% CO_2)_{adj}$ is the adjusted $CO_2$ percentage which removes the effect of $CO_2$ absorption and dilution air.

$(\% CO_2)_{di}$ is the percentage of $CO_2$ measured before the scrubber, dry basis.

$Q_{di}$ is the volumetric flow rate before the scrubber, average of two runs, dscf/min (using Method 2), and

$Q_{do}$ is the volumetric flow rate after the scrubber, dscf/min (using Methods 2 and 5).

(6) Alternatively, the following procedures may be substituted for the procedures under paragraphs (c)(3), (4), and (5) of this section:

(i) Simultaneously with each particulate matter run, extract and analyze for $CO_2$, $O_2$, and $N_2$ an integrated gas sample according to Method 3, traversing the three sample points and sampling for

Note ... taken ... RECEIVED before scrubber 5.0% $CO_2$

# ATMOSPHERIC EMISSION EVALUATION

RECEIVED
MAY 14 1984
ENVIRONMENTAL CONSERVATION
REGION II

## ANCHORAGE WATER & WASTEWATER UTILITY

## SEWAGE SLUDGE INCINERATOR

APRIL 1984

**ASA CONSULTANTS**

15049 Bel-Red Road, Bellevue, WA 98007 (206)641-5130

# DISCUSSION

The incinerator at the Point Woronzof Treatment Plant of the Anchorage Water and Wastewater Utility is a continuous feed, continuous ash removal incinerator. The incinerator is identifed as Furnace No. 71343 built by BSP-Envirotech in Belmont, California. A log of incinerator operation was maintained during the times the samples were collected and is available from J. Kris Warren of the Anchorage Water & Wastewater Utility (907)243-2151.

Over five (5.68) diameters were available ahead and more than two (2) diameters of straight unobstructed duct were available behind the two (2) sample ports at 90 degrees apart so sixteen (16) traverse points on each of two (2) diameters were selected for collecting the first sample. The first sample revealed a uniform velocity and resulted in collecting over 80 cubic feet of sample requiring 96 minutes to complete using three (3) minutes per sample traverse point. Samples two and three were collected with the same three (3) minutes per sample traverse point however the sample points were reduced to ten (10) per traverse for a sixty (60) minute sample period. Sample one was collected over the first half of the test assuming a fifteen percent (15%) moisture in the stack which accounts why the nozzle velocity was less than the desired minimum of 90%. Corrections were made for nonisokinetic nozzle velocities in the report. The first and second samples were collected assuming the nozzle diameter was 0.25 inches which upon checking after the second sample was found to be 0.265 inches. The assumed less than actual nozzle diameter accounts for the less than desirable nozzle velocity on Run #1 and why the Run #2 nozzle velocity was less than Run #3.

leaks by pinching the flexible hose connected to the Method 5 sample train outlet tap and the pump and was considered leak tight if the stack gas bubbling through the leveling bulb of the Orsat stopped after a short period of time (e.g. 30 seconds).

The quantity of auxiliary fuel burned during the day of sampling was 24,500 cubic feet or 17 cubic feet per minute. One cubic foot of natural gas produces one cubic foot of carbon dioxide in the combustion process. The percent carbon dioxide procduced in the stack which consists of an average of 5012 dscfm from burning the auxiliary fuel is therefore 0.34% carbon dioxide which was subtracted from the measured carbon dioxide before making the correction to 12% carbon dioxide.

Dilution air (i.e from cooling of the incinerator shaft) was entering the stack at a position just after the incinerator exhaust fan and just below the roof. Oxygen readings were taken at the exhaust fan outlet (i.e. just below the dilution air inlet) and in the exhaust stack where the samples were collected. Knowing that the oxygen concentration of the dilution air is 21%, the total airflow is 5012 dscfm, the average oxygen at the incinerator exhaust fan outlet was 13.65%, the average oxygen concentration at the stack was 15.88% and balancing the oxygen and air with the two equations listed below, the quantity of dilution air was determined.

EQ 1. Incin Air + Dil Air = Stack Air = I + D = 5012 dscfm

EQ 2, Incin $O_2$ + Dil $O_2$ = Stack $O_2$ = (0.1588)(5012) = 795.9

$(I)(0.1365) + (D)(0.21) = 795.9$ with $D = 5012 - I$

Therefore, D = 1521 dscfm

The effect of dilution air on the emissions is accounted for in the correction

[illegible] CONSULTANTS

E.P.A. METHOD 5 SUMMARY

CLIENT: ANCHORAGE WATER & WASTEWATER UTILITY PT WORONZOF TREATMENT PLANT

SAMPLING LOCATION: SEWAGE SLUDGE INCINERATOR STACK EMISSIONS - APRIL 1984

| | RUN # 1<br>4/13/84 | RUN # 2<br>4/13/84 | RUN # 3<br>4/13/84 |
|---|---|---|---|
| LAB NUMBER | 27-4 | 28-4 | 29-4 |
| 24 HOUR START TIME | 930 | 1335 | 1559 |
| 24 HOUR STOP TIME | 1117 | 1437 | 1702 |
| ELAPSED SAMPLING TIME, MIN | 96.2 | 60 | 60 |
| VOLUME SAMPLED, CU FT | 81.636 | 56.192 | 64.894 |
| VOLUME SAMPLED STANDARD, CU FT | 78.9862 | 53.2465 | 61.9348 |
| MOISTURE CONTENT OF STACK GAS, % | 1.78421 | 1.75912 | 1.81087 |
| MOLEC. WT OF STACK GAS, LB/LB MOLE | 29.23 | 29.2223 | 29.2116 |
| STACK PRESSURE, IN HG | 29.6669 | 29.6869 | 29.7469 |
| PITOT COEFFICIENT | .822 | .822 | .822 |
| VELOCITY OF STACK GAS, FT/SEC | 49.1617 | 48.2209 | 50.4552 |
| STACK AREA, SQR FT | 1.96895 | 1.96895 | 1.96895 |
| STACK GAS FLOW RATE, ACTUAL CU FT/MIN, WET | 5807.81 | 5696.67 | 5960.62 |
| TEMPERATURE OF STACK, DEG F | 142.313 | 132.9 | 138.4 |
| STACK GAS FLOW RATE, STD CU FT/MIN, DRY | 4958.11 | 4945.03 | 5134.26 |
| DIAMETER OF NOZZLE, INCHES | .265 | .265 | .265 |
| PERCENT ISOKINETIC OF TEST, % | 85.1286 | 92.2543 | 103.353 |
| WEIGHT PARTICULATE COLLECTED, MG | 32.4 | 23.3 | [illegible] |
| PARTICULATE CONCENTRATION, GRAINS/STD CU FT | 6.31705E-03 | 6.73884E-03 | [illegible] |
| PERCENT CO2 CONTENT OF STACK GAS | 5.32 | 5.23 | [illegible] |
| PART. CONC AT 12% CO2, GR/STD CU FT | .014249 | .015462 | [illegible] |
| POLLUTANT MASS RATE (CONC. METHOD), LB/HR | .268449 | .285618 | [illegible] |
| POLLUTANT MASS RATE (AREA RAT. METHOD), LB/HR | .228599 | .263508 | [illegible] |
| POLLUTANT MASS RATE (AVERAGE OF 48 APF) LB/HR | .248491 | .274563 | [illegible] |
| PARTICULATE CONCENTRATION (CORRECTED) | .0131891 | .0148628 | .43795 |

## PARTICULATE CONCENTRATION AND PMR CALCULATION TERMINOLOGY

(Page 2)

| | | |
|---|---|---|
| Y (Y) | = | Dry gas meter calibration factor |
| Qs, $Q_{os}$ ($Q_{SD}$) | = | Stack flow rate at standard conditions - scfm (dry) |
| T (~~$\theta$~~) | = | Time over which sample was collected - minutes |
| VN, $V_n$ ($V_{S(std)}$) | = | Velocity of gases inside nozzle during sampling, at STP -fps |
| I (I) | = | % Isokinetic ($\pm$ 10% desirable) |
| CO, $C_o$ ($C_S$) | = | Particulate concentration - grains/scf |
| N (%$CO_2$) | = | %$CO_2$ by volume in stack (12 indicates no % $CO_2$ correction is to be made |
| TS, $T_s$ ($T_{si}$) | = | Temperature of stack gas at each sampling point - $^oF$ (Use $^oR$ = 460 + $^oF$ in equations) |
| C (*) | = | Particulate concentration corrected to 12% $CO_2$ |
| PMRC, $PMR_c$ (*) | = | Pollutant mass rate - "concentration method" - lb/hr |
| PMRR, $PMR_r$ (*) | = | Pollutant mass rate - "area ratio method" - lb/hr |
| PMRAVG, $\overline{PMR}$ (*) | = | Average pollutant mass rate - lb/hr |
| CPRIME, C' (*) | = | Particulate concentration corrected for non-isokinetic sampling condition - grains/scf |
| PT, $P_T$ ($M_n$) | = | Total particulate collected by sampling train - mg |
| A1, A2, $A_s$ (A) | = | Area of stack - $FT^2$ A2 = 0 if round stack |
| $A_n$ ($A_n$) | = | Area of nozzle - $FT^2$ |
| DN (*) | = | Diameter of nozzle in $IN^2$ |
| CP, $C_p$ ($C_p$) | = | Velocity correction coefficient for type pitot tube used - dimensionless, normally 0.80 to 0.90 for "S" type pitot tube and 1.0 for "P" type pitot tube |
| KA, $K_a$ (*) | = | Average $\sqrt{VH \times T_s}$ |

‡Notation in parenthesis to the right of the ASA nomenclature is the equivalent EPA 40 CFR 60 Method 5 notation

* Notation used by ASA for calculations not required by 40 CFR 60 Method 5

## PROCEDURE

## EPA METHOD 5 PARTICULATE SAMPLING TRAIN

### Sampling Train Preparation:

A tared and labeled glass fiber filter was placed in a glass filter holder. The filter (MSA1106BH) was desiccated and weighed to a constant weight to the nearest 0.5 mg. The condenser section consisted of four glass containers in series: one hundred milliliters of distilled-deionized water in a bubbler; one hundred milliliters in an impinger; a dry bubbler; and, a bubbler filled with approximately 500 grams of silica gel. All of the containers were weighed to the nearest 0.1 gram. The sampling train was assembled with connecting glassware so that sample gas would pass through the filter, the bubbler, impinger, the dry bubbler and the silica gel respectively.

A nozzle of a size that would allow for isokinetic sampling was selected and cleaned. A probe and liner of appropriate length to traverse the stack was chosen and the liner cleaned with acetone and a brush. The nozzle was connected with a cleaned union to the probe and liner. The probe was connected in front of the filter. A schematic of the sampling equipment is included in this report.

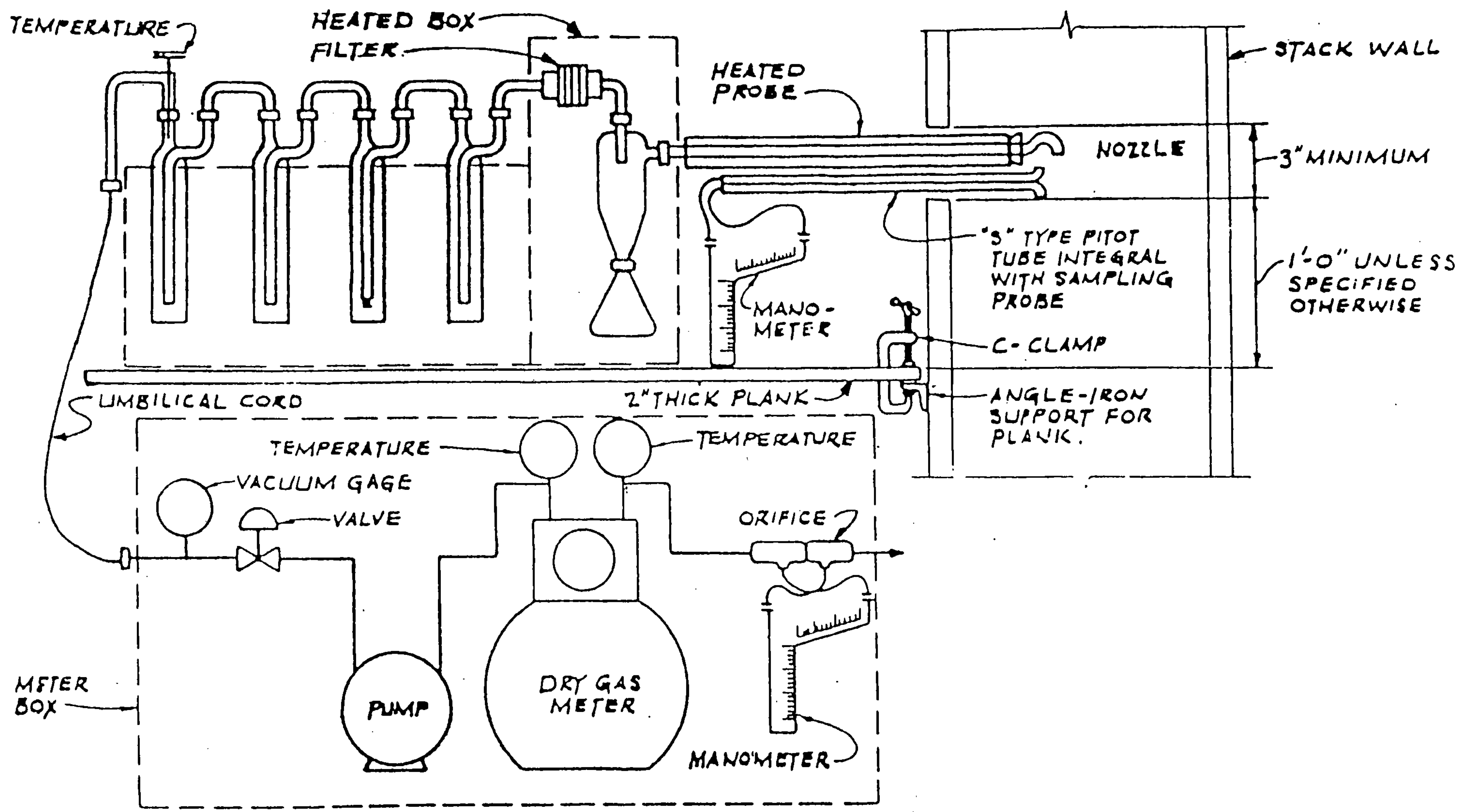
A leak test was performed on the assembled sampling train. The leak rate did not exceed 0.02 cfm at a vacuum of 10 inches Hg. The probe was heated and maintained at or above 250 degrees plus or minus 25 degrees F. The filter was heated and maintained at 250 degrees plus or minus 25 degrees F to avoid condensation of moisture on the filter. Crushed ice was placed around the condenser at the beginning of the test with new ice being added as required to keep the gases leaving the sampling train below 70 degrees F.

### Sample Collection:

Sampling ports were selected and installed. The number of sampling points was determined based on the number of stack diameters from any flow disturbance to the port(s). The location of each sampling point was based on equal areas within the stack.

The time at each point was dependent on the stack velocity and the desired volume to be sampled.

The probe was inserted into the stack to the first traverse point with the nozzle tip pointing directly into the gas stream. The pump was started and immediately adjusted to sample at isokinetic velocities. Equal time was spent at each time interval. The EPA designed nomograph or equivalent was used to maintain isokinetic sampling throughout the sampling period. At the conclusion of the run the pump was turned off, and a final leak test was performed at the maximum vacuum incurred during sampling. If the post-test leak rate was found to be over 0.02 cfm the actual leak rate was recorded.




| FIGURE 1. EPA METHOD 5 PARTICULATE SAMPLING TRAIN | |
|---|---|
| DRAWN RSC<br>CHECKED WS<br>DATE 9/30/74 | CONSULTANTS<br>Bellevue, WA |

ASA CONSULTANTS PARTICULAT CALCULATION

CLIENT: ANCHORAGE WATER & WASTEWATER UTILITY WORONZOF TREATMENT PLANT

LOCATION: SEWAGE SLUDGE INCINERATOR STACK EMISSIONS

SAMPLE DATE: 4/13/84 ANALYSIS DATE: 4/16-24/84

RUN # 1 LAB # 27-4

************************************************************

I. EVAPORATION OF 75 ml OF ACETONE RINSE AND (B)
BRUSHING OF NOZZLE, PROBE AND GLASSWARE BEFORE FILTER.

FINAL 79723.7 mg - TARE 79721.5 mg
- BLANK (( 5E-03 mg/ml) ( 75 ml) = .375 mg) = 1.825 mg

II. FILTER CATCH - FILTER MSA1106BH - NUMBER 9-4 (A)

FINAL 424.5 mg - TARE 393.9 mg = 30.6 mg

VII. TOTAL PARTICULATE = SUM OF ABOVE = 32.425 mg

BLANKS

ACETONE (FINAL 80883.9 mg - TARE 80883.4 mg = .5 mg)
/ 100 ml = 5E-03 mg/ml

ASA CONSULTANTS PARTICULATE CALCULATION

CLIENT: ANCHORAGE WATER & WASTEWATER UTILITY TREATMENT PLANT

LOCATION: SEWAGE SLUDGE INCINERATOR STACK EMISSIONS

SAMPLE DATE: 4/13/84 ANALYSIS DATE: 4/16-24/84

RUN # 2 LAB # 28-4

**************************************************

I. EVAPORATION OF 95 ml OF ACETONE RINSE AND (B)
BRUSHING OF NOZZLE, PROBE AND GLASSWARE BEFORE FILTER.

FINAL 77867.4 mg - TARE 77861.3 mg
- BLANK (( 5E-03 mg/ml) ( 95 ml) = .475 mg) = 5.625 mg

II. FILTER CATCH - FILTER MSA1106BH - NUMBER 7-4 (A)

FINAL 406.1 mg - TARE 388.4 mg = 17.7 mg

VII. TOTAL PARTICULATE = SUM OF ABOVE = 23.325 mg

BLANKS

ACETONE (FINAL 80883.9 mg - TARE 80883.4 mg = .5 mg)
/ 100 ml = 5E-03 mg/ml

ASA CONSULTANTS PARTICULATE CALCULATION

CLIENT: ANCHORAGE WATER & WASTEWATER UTILITY TREATMENT PLANT

LOCATION: SEWAGE SLUDGE INCINERATOR STACK EMISSIONS

SAMPLE DATE: 4/13/84 ANALYSIS DATE: 4/16-24/84

RUN # 3 LAB # 29-4

**************************************************

I. EVAPORATION OF 130 ml OF ACETONE RINSE AND (B)
BRUSHING OF NOZZLE, PROBE AND GLASSWARE BEFORE FILTER.

FINAL 80699.75 mg - TARE 80699.10000000001 mg
- BLANK (( 5E-03 mg/ml) ( 130 ml) = .65 mg) = 2.38397E-08 mg

II. FILTER CATCH - FILTER MSA1106BH - NUMBER 11-4 (A)

FINAL 419.4 mg - TARE 394.8 mg = 24.6 mg

VII. TOTAL PARTICULATE = SUM OF ABOVE = 24.6 mg

BLANKS

ACETONE (FINAL 80883.9 mg - TARE 80883.4 mg = .5 mg)
/ 100 ml = 5E-03 mg/ml

# ASA CONSULTANTS

TRAVERSE SAMPLING DATA SHEET

CLIENT Anch WWW Utility DATE 4/13/84 1/2

PORT LOCATION Sludge Incinerator Stack

RUN NO. 1 LAB NO. 27-4

OPERATOR/S SNOWDEN

SAMPLE BOX NO. BLACK METER BOX ΔH@ 1.82

FILTER NO. 9-4 TARE ___ Mg

DISTANCE UPSTREAM & DOWNSTREAM FROM OBSTRUCTION ___

BFR DIL = 13.75 % O2 } ~~9.8~~

AFTER DIL = ~~16~~ % O2 }

~~BFR~~ AFTER DIL = 14.75 % O2 } 11.40

BFR DIL 12.5

| | FINAL WT. gm | INITIAL WT. gm | NET WT. gm |
|---|---|---|---|
| #1 BUBBLER | 428.5 | 431.7 = | -3.2 |
| #2 IMPINGER | 435.1 | 425.1 = | 10.0 |
| #3 BUBBLER | 352.5 | 349.2 = | 3.3 |
| #4 SILICA GEL | 720.7 | 700.4 = | 20.3 |
| TOTAL WATER VOLUME (1gm = 1 ml) | | | 30.4 |

BOX AND PROBE HEATER SETTING ___

BAROMETRIC PRESSURE ($P_B$) 29.70 "Hg

LEAK RATE 0.005 CFM @ 11 "Hg

PORT PRESSURE ($P_S$) -.45 "$H_2O$ = ___ "Hg

$P_{SN} = P_B + P_S$ ___ "Hg

ASSUMED MOISTURE ~~10~~ 20.2 % MAX VH 0.7 "$H_2O$

C FACTOR 0.73 0.98

REF. ΔP 0.72 0.98

STACK DIMENSIONS 19'0" AREA ___ $F^2$

PROBE NOZZLE DIA 0.265 IN; $A_N$ ___ $F^2$

PROBE LENGTH 18" NUMBER 28 SIDE 2

SCHEMATIC OF TRAVERSE POINT LAYOUT

Cp = 0.822

| CLOCK TIME (24 HRS) | FLAP TIME (MIN) | DRY GAS METER (CUBIC FEET) | DRY GAS TEMP. (°F) INLET | DRY GAS TEMP. (°F) OUTLET | BOX TEMP. (°F) | IMPINGER TEMP. (°F) | POINT | PITOT VH ("$H_2O$) | ORIFICE ΔH ("$H_2O$) DESIRED | ORIFICE ΔH ("$H_2O$) ACTUAL | PUMP VACUUM ("Hg GA) | STACK TEMP. (°F) | OPACIT. OR %$CO_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 930 | 0 | 16.477 | 55 | 54 | 244 | 44 | W 1 | 0.45 | 1.15 | 1.15 | 1.5 | 141 | 5.0, 18.8, 18 |
| | 3 | 18.60 | 58 | 54 | 248 | 43 | W 2 | 0.45 | 1.15 | 1.15 | 1.5 | 141 | |
| | 6 | 19.90 | 60 | 54 | 258 | 42 | 3 | 0.54 | 1.32 | 1.32 | 1.8 | 143 | |
| | 9 | 21.80 | 64 | 55 | 255 | 42 | 4 | 0.60 | 1.52 | 1.52 | 2.1 | 145 | |
| | 12 | 24.0 | 68 | 55 | 261 | 42 | 5 | 0.60 | 1.52 | 1.52 | 2.1 | 146 | |
| | 15 | 26.0 | 73 | 56 | 260 | 42 | 6 | 0.64 | 1.58 | 1.58 | 2.2 | 146 | |
| | 18 | 28.30 | 76 | 57 | 256 | 42 | 7 | 0.69 | 1.70 | 1.70 | 2.3 | 147 | |
| | 21 | 30.20 | 79 | 59 | 252 | 45 | 8 | 0.72 | 1.80 | 1.80 | 2.4 | 149 | |
| | 24 | 32.30 | 83 | 60 | 253 | 47 | 9 | 0.72 | 1.80 | 1.80 | 2.4 | 142 | |
| | 27 | 34.50 | 87 | 62 | 250 | 49 | 10 | 0.81 | 2.0 | 2.00 | 2.5 | 133 | |
| | 30 | 37.05 | 91 | 64 | 243 | 50 | 11 | 0.85 | 2.15 | 2.15 | 2.8 | 125 | |
| | 33 | 38.95 | 95 | 67 | 242 | 50 | 12 | 0.88 | 2.18 | 2.18 | 3.0 | 120 | |
| | 36 | 40.98 | 99 | 69 | 241 | 52 | 13 | 0.88 | 2.18 | 2.18 | 3.0 | 117 | 6.2, 18.2, 18 |
| | 39 | 44.21 | 101 | 74 | 240 | 53 | 14 | 0.88 | 2.18 | 2.18 | 3.0 | 113 | |
| | 42 | 46.55 | 101 | 75 | 242 | 53 | 15 | 0.85 | 2.15 | 2.15 | 2.8 | 115 | |
| | 45 | 49.15 | 104 | 76 | 246 | 54 | W 16 | 0.85 | 2.15 | 2.15 | 2.8 | 116 | |
| | 48 | 51.674 | 105 | 78 | 249 | 54 | N 1 | 0.40 | 1.50 | 1.50 | 2.1 | 185 | |
| 1031 | 51 | 53.85 | 100 | 83 | 247 | 49 | 2 | 0.40 | 1.50 | 1.50 | 2.2 | 195 | |
| 34 | 54 | 56.60 | 103 | 84 | 245 | 49 | 3 | 0.48 | 1.85 | 1.85 | 2.7 | 194 | |
| 37 | 57 | 58.50 | 105 | 86 | 240 | 48 | 4 | 0.50 | 1.88 | 1.88 | 3.0 | 194 | 4.9, 19.4, 19.9 |
| 40 | 60 | 60.70 | 107 | 87 | 239 | 48 | 5 | 0.57 | 2.10 | 2.10 | 3.1 | 193 | |
| 43 | 63 | 62.95 | 109 | 89 | 242 | 49 | 6 | 0.65 | 2.4 | 2.4 | 3.9 | 190 | |
| 46 | 66 | 66.00 | 112 | 90 | 245 | 49 | 7 | 0.70 | 2.6 | 2.6 | 4.1 | 181 | |
| 49 | 69 | 68.80 | 114 | 91 | 247 | 50 | 8 | 0.82 | 3.1 | 3.1 | 4.5 | 146 | |
| 1052 | 72 | 71.82 | 115 | 91 | 249 | 51 | | | | | | | |
| TOTAL | | | 2265 | 1770 | | | | | | 45.46 "$H_2O$ | | | |
| AVERAGE | | | 4035 °F = °R | | | | | | | $H_2O$ = "Hg | | °R | |

$P_m = P_B + ΔH$ = "Hg

CLIENT Anch W&WW Utility DATE 4/13/84

PORT LOCATION SLUDGE INCINERATOR OUTLET

RUN NO. 2 LAB NO. 28-4

OPERATOR/S SNOWDEN

SAMPLE BOX NO. RED METER BOX ΔH@ ____

FILTER NO. 7-4 TARE ____ Mg

# ASA CONSULTANTS

TRAVERSE SAMPLING DATA SHEET

| | FINAL WT. gm | INITIAL WT. gm | NET WT. gm |
|---|---|---|---|
| 1 BUBBLER | 423.9 | 426.4 | = -2.5 |
| 2 BUBBLER | 431.1 | 426.2 | = 4.9 |
| 3 BUBBLER | 355.1 | 350.8 | = 4.3 |
| 4 SILICA GEL | 734.2 | 720.7 | = 13.5 |

TOTAL WATER VOLUME (1gm = 1 ml) 20.2

DISTANCE UPSTREAM & DOWNSTREAM FROM OBSTRUCTION ____ & ____

5.7 5.5 5.5 | 5.57 INTEGRATED
18.9 18.8 18.9 | 18.8 BAG
18.4 18.9 18.9 | 18.9

15.5 % O2 AFTER DIL.
13.25 % O2 BEFORE DILUTION } 13.1 O

SCHEMATIC OF TRAVERSE POINT LAYOUT

BOX AND PROBE HEATER SETTING ____ & ____

BAROMETRIC PRESSURE ($P_B$) 29.72 "Hg

LEAK RATE 0.004 BEG. 0.000 CFM @ 11 END "Hg

PORT PRESSURE ($P_S$) ~~-0.26~~ "$H_2O$ = ____ "Hg

$P_{SN} = P_B + P_S$ ____ "Hg

ASSUMED MOISTURE ____ % MAX VH ____ "$H_2O$

C FACTOR ____

REF. ΔP 0.48

STACK DIMENSIONS 19 1/2" AREA ____ $F^2$

PROBE NOZZLE DIA 0.265 IN; $A_N$ ____ $F^2$

PROBE LENGTH 18" NUMBER 28 SIDE 2

CP = 0.82

INSTANTANEOUS READINGS: RECORDED @ BEGINNING OF TIME INTERVAL | AVERAGE VALUES READ WITHIN THE TIME INTERVAL

| CLOCK TIME (24 HRS) | ELAP. TIME (MIN) | DRY GAS METER (CUBIC FEET) | DRY GAS TEMP. (°F) INLET | DRY GAS TEMP. (°F) OUTLET | BOX TEMP. (°F) | IMPINGER TEMP. (°F) | POINT | PITOT VH ("$H_2O$) | ORIFICE ΔH ("$H_2O$) DESIRED | ORIFICE ΔH ("$H_2O$) ACTUAL | PUMP VACUUM ("Hg GA) | STACK TEMP. (°F) | OPACITY OR %$CO_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ~~1335~~ | 0 | 124.708 | 88 | 82 | 225 | 44 | | | | | | | |
| | 3 | 126.50 | 90 | 81 | 225 | 46 | N2 | 0.45 | 1.7 | 1.7 | 1.8 | 184 | |
| | 6 | 129.10 | 92 | 81 | 230 | 46 | 2 | 0.45 | 1.7 | 1.7 | 1.8 | 178 | 4.2, |
| | 9 | 131.80 | 93 | 80 | 235 | 47 | 3 | 0.47 | 1.75 | 1.75 | 1.9 | 174 | |
| | 12 | 134.00 | 94 | 80 | 240 | 47 | 4 | 0.54 | 2.0 | 1.75 | 2.0 | 160 | |
| | 15 | 136.10 | 96 | 80 | 248 | 47 | 5 | 0.64 | 2.35 | 2.35 | 2.5 | 132 | |
| | 18 | 139.05 | 99 | 81 | 250 | 47 | 6 | 0.83 | 3.10 | 3.10 | 3.0 | 122 | |
| | 21 | 142.35 | 103 | 81 | 254 | 48 | 7 | 0.90 | 3.35 | 3.35 | 3.5 | 118 | |
| | 24 | 145.5 | 107 | 82 | 259 | 52 | 8 | 0.91 | 3.4 | 3.4 | 3.5 | 116 | |
| | 27 | 149.00 | 110 | 84 | 262 | 52 | 9 | 0.91 | 3.4 | 3.4 | 4.0 | 115 | |
| 1407 | 30 | 151.846 | 111 | 85 | 265 | 53 | 10 | 0.90 | 3.35 | 3.35 | 3.8 | 110 | 5.7, 18.8, 18.9 |
| | 33 | 154.50 | 111 | 87 | 264 | 52 | W1 | 0.52 | 1.90 | 1.90 | 2.2 | 137 | |
| | 36 | 156.95 | 111 | 88 | 262 | 51 | 2 | 0.57 | 2.1 | 2.1 | 2.3 | 138 | |
| | 39 | 160.00 | 111 | 89 | 261 | 50 | 3 | 0.58 | 2.15 | 2.15 | 2.5 | 139 | |
| | 42 | 162.65 | 112 | 90 | 257 | 52 | 4 | 0.67 | 2.5 | 2.5 | 2.9 | 139 | |
| | 45 | 164.90 | 113 | 91 | 257 | 53 | 5 | 0.73 | 2.75 | 2.75 | 3.2 | 132 | 4.0, 10.0, 18 |
| | 48 | 167.87 | 116 | 93 | 253 | 53 | 6 | 0.77 | 2.9 | 2.9 | 3.5 | 127 | |
| | 51 | 171.35 | 119 | 94 | 256 | 52 | 7 | 0.81 | 3.1 | 3.1 | 3.6 | 120 | |
| | 54 | 175.00 | 120 | 95 | 259 | 54 | 8 | 0.85 | 3.15 | 3.15 | 3.9 | 113 | 4.8, 18.6, 18 |
| | 57 | 177.30 | 121 | 95 | 262 | 57 | 9 | 0.79 | 2.9 | 2.9 | 3.2 | 108 | |
| 1437 | 60 | 180.159 | 122 | 96 | 265 | 58 | 10 | 0.79 | 2.9 | 2.9 | 3.3 | 106 | |
| TOTAL | 60 | 56.192 | 2239 | 1815 | | | | | | 52.2 "$H_2O$ | | | |
| AVERAGE | | | 96.5 °F = | °R | | | | | 2.61 "$H_2O$ = | "Hg | | | |
| | | | | | | | | | $P_m = P_B + \Delta H$/13.6 = | "Hg | | | |

# DRY GAS METER AND ORIFICE CALIBRATION LOG

Meter Box No. #1

Dry Gas Meter Identification Meter Box #1

Date 4/17/84

Barometric Pressure, Pb 29.8 In. HG

Technician W. D. Snowden

| Orifice Manometer Setting, ΔH, in $H_2O$ | Gas Volume Wet Test Meter $V_w$, $ft^3$ | Gas Volume Dry Gas Meter $V_d$, $ft^3$ | Temperature: Wet Test Meter $t_w$ °F | Temperature: Dry Gas Meter Inlet $t_{di}$, °F | Temperature: Dry Gas Meter Outlet $t_{do}$, °F | Temperature: Dry Gas Meter Average $t_d$, °F | Time θ min. | γ | ΔH@ |
|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 5 | 5.14 | 64.5 | 87.5 | 76.5 | 82 | 13.6 | 1.004 | 2.011 |
| 1.0 | 5 | 5.272 | 64 | 96.5 | 84 | 90.25 | 9.3 | 0.993 | 1.852 |
| 2.0 | 10 | 10.628 | 63.5 | 108 | 89.5 | 97.5 | 12.8 | 0.997 | 1.733 |
| 4.0 | 10 | 10.738 | 63.5 | 119 | 95.5 | 107.25 | 9.1 | 0.999 | 1.733 |
| 6.0 | 10 | 10.757 | 63.5 | 125.5 | 99.5 | 112.5 | 7.5 | 1.002 | 1.753 |
| | 10 | | | | | | | | |
| | | | | | | | Average | 0.999 | 1.816 |

Calculations

| ΔH | $\frac{\Delta H}{13.6}$ | γ: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \Delta H/13.6)(t_w + 460)}$ | ΔH@: $\frac{0.0317\ \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w}\right]^2$ |
|---|---|---|---|
| | | ( )( )( ) / ( )( )( ) = | 0.0317 ( ) / ( )( ) [ ]² = |
| | | ( )( )( ) / ( )( )( ) = | 0.0317 ( ) / ( )( ) [ ]² = |
| | | ( )( )( ) / ( )( )( ) = | 0.0317 ( ) / ( )( ) [ ]² = |
| | | ( )( )( ) / ( )( )( ) = | 0.0317 ( ) / ( )( ) [ ]² = |
| | | ( )( )( ) / ( )( )( ) = | 0.0317 ( ) / ( )( ) [ ]² = |
| | | ( )( )( ) / ( )( )( ) = | 0.0317 ( ) / ( )( ) [ ]² = |

γ = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ±0.01

ΔH@ = Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 inches of mercury, in $H_2O$. Tolerance = ±0.15

SOURCE NAME: Pt. Woronzof STP Incinerator

SOURCE ID NUMBER: 0321-AA-07

OBSERVATION DATE: 4/13/84

ADDRESS: 3200 Hutson Dr.

OBSERVER'S NAME (PRINT): Bill MacClarence

ORGANIZATION: AK Dept of Env. Conserv.

STATE: AK | ZIP: 99503 | PHONE: 243-2151

CERTIFIED BY: Anch. Air Poln Control Agency

DATE: 10/27/84


PROCESS: sludge incinerator

OPERATING MODE:

CONTROL EQUIPMENT: wet scrubber

OPERATING MODE:

DESCRIBE EMISSION POINT: stack exit after dilution air

EMISSION POINT HEIGHT ABOVE GROUND LEVEL: 35'

EMISSION POINT HEIGHT RELATIVE TO OBSERVER: 45'

DISTANCE TO EMISSION POINT: 180'

DIRECTION TO EMISSION POINT: NE

DESCRIBE EMISSIONS: straight well defined plume

COLOR OF EMISSIONS: brown/yellow

CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐

WATER VAPOR PRESENT: NO ☑ YES ☐

IF YES, IS PLUME: ATTACHED ☐ DETACHED ☐ N/A

AT WHAT POINT WAS OPACITY DETERMINED: stack exit

DESCRIBE BACKGROUND: Overcast sky

COLOR OF BACKGROUND: white

SKY CONDITIONS: overcast

WIND SPEED: 0-5

WIND DIRECTION: E

AMBIENT TEMPERATURE: 50

RELATIVE HUMIDITY:

COMMENTS: during run No. 3 source test

transmissometer reading 8%

START TIME: 1608 STOP TIME: 1627

| | 0 | 15 | 30 | 45 | | 0 | 15 | 30 | 45 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 5 | 5 | 5 | 5 | 31 | | | | |
| 2 | 10 | 5 | 0 | 5 | 32 | | | | |
| 3 | 5 | 5 | 5 | 5 | 33 | | | | |
| 4 | 0 | 5 | 0 | 5 | 34 | | | | |
| 5 | 5 | 5 | 0 | 10 | 35 | | | | |
| 6 | 5 | 5 | 0 | 0 | 36 | | | | |
| 7 | 0 | 5 | 5 | 0 | 37 | | | | |
| 8 | 5 | 5 | 0 | 0 | 38 | | | | |
| 9 | 0 | 0 | 0 | 5 | 39 | | | | |
| 10 | 5 | 10 | 0 | 5 | 40 | | | | |
| 11 | 0 | 5 | 0 | 5 | 41 | | | | |
| 12 | 5 | 5 | 0 | 0 | 42 | | | | |
| 13 | 0 | 0 | 0 | 0 | 43 | | | | |
| 14 | 0 | 0 | 0 | 5 | 44 | | | | |
| 15 | 0 | 0 | 0 | 0 | 45 | | | | |
| 16 | 5 | 0 | 0 | 10 | 46 | | | | |
| 17 | 5 | 0 | 0 | 0 | 47 | | | | |
| 18 | 0 | 0 | 5 | 5 | 48 | | | | |
| 19 | 0 | 0 | 5 | 5 | 49 | | | | |
| 20 | 5 | 0 | 0 | 0 | 50 | | | | |
| 21 | | | | | 51 | | | | |
| 22 | | | | | 52 | | | | |
| 23 | | | | | 53 | | | | |
| 24 | | | | | 54 | | | | |
| 25 | | | | | 55 | | | | |
| 26 | | | | | 56 | | | | |
| 27 | | | | | 57 | | | | |
| 28 | | | | | 58 | | | | |
| 29 | | | | | 59 | | | | |
| 30 | | | | | 60 | | | | |

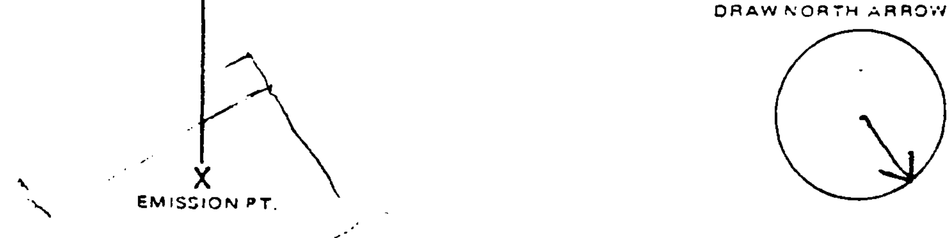
AVERAGE OPACITY: 2.1%

NUMBER OF READINGS ABOVE 20 % WERE none

RANGE OF OPACITY READINGS FROM 0 TO 10

SOURCE LAYOUT SKETCH

DRAW NORTH ARROW




OBSERVER'S SIGNATURE: [signature]

DATE: 4/13/84

VERIFIED BY

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS.

SIGNATURE

TITLE

DATE / /

| Hearth | Temp (°F) | No. of Gas Burners |
| --- | --- | --- |
| 1 | 1000 (538°C) | 2 |
| 2 | 1250 | 2 |
| 3 | 1250 (677°C) | |
| 4 | 1400 (760°C) | 2 |
| 5 | 900-1400 | 2 |
| 6 | 500 max | — |

rec'd @ plant 4/13/83

Sent to TRW & EPA

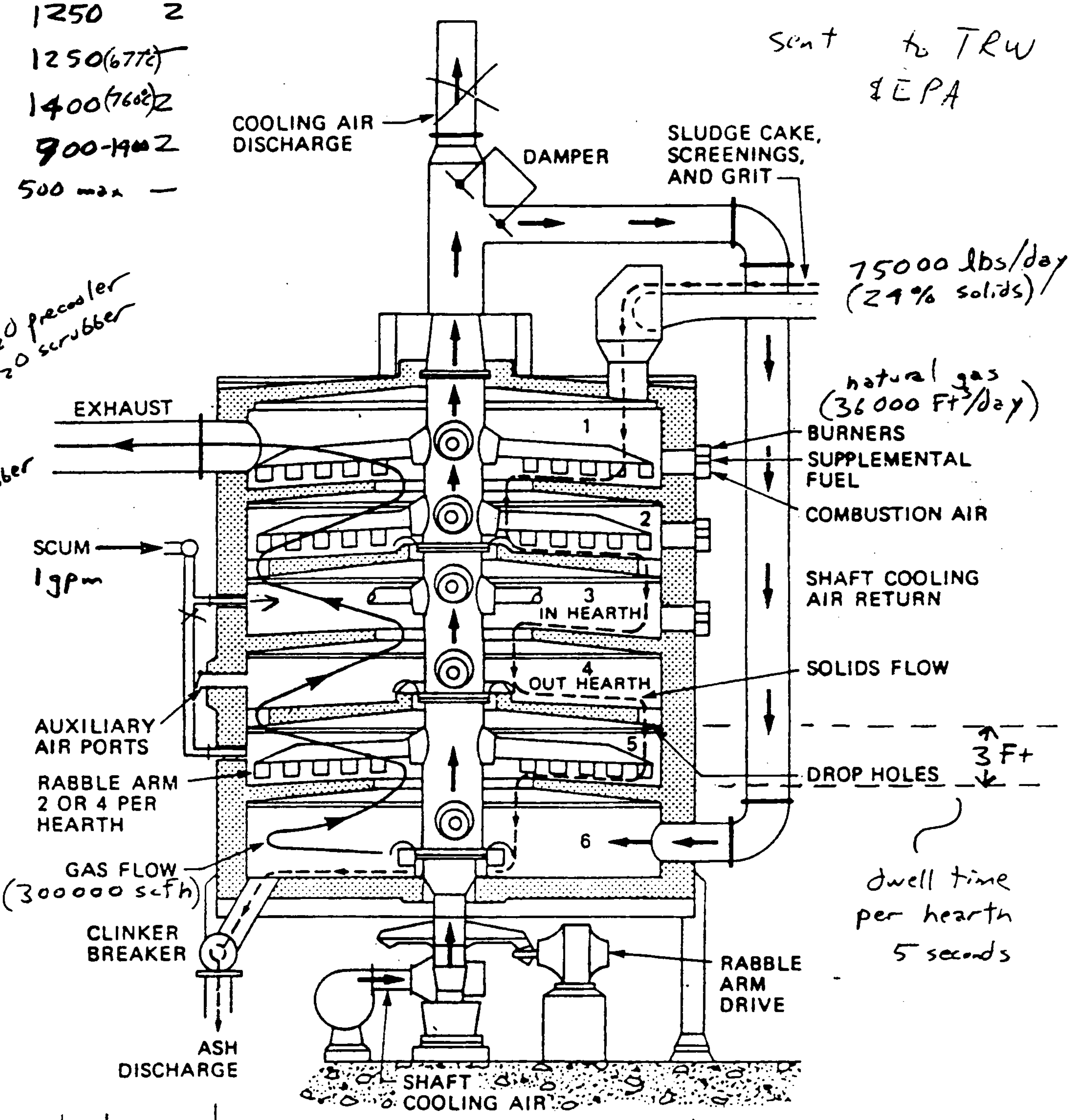



**FIGURE 11-6**

**CROSS SECTION OF A MULTIPLE-HEARTH FURNACE**

14 Ft 3½ in

BSP-Envirotech
Furnace No. 71343
Job No. 5737
Contract #12, phase 2
Lurgi (Parent Co.)
Belmont, Calif.