AP42 Section: 11.1

Reference Number: 232

Title: Source Sampling For Particulate Emissions, I. A. Construction Corp.,San Diego, CA,

San Diego Air Pollution Control District, San Diego, CA,

January 24, 1990.

AP-42 Section 11.1
Reference
Report Sect. 4
Reference 232 ~~239~~
Same facility as Ref 232 234, 235, 236

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
9150 CHESAPEAKE DRIVE
SAN DIEGO, CA. 92123

SUMMARY:
SOURCE TEST OF PARTICULATE EMISSIONS TO THE ATMOSPHERE
RETEST

TEST SITE: INDUSTRIAL ASPHALT
8150 FRIARS RD.
SAN DIEGO, CA 92108

TEST #: 90024 P/O # : 30431 TEST DATE: 24 JANUARY 1990

EQUIPMENT: Asphalt batch plant, Hot-mix (350-ton/hr), Stansteel model RM80 Plant, S/N 903, 5 ton batcher, Genco model FP103 oil/gas burner (103MM BTU/hr), 8'D*36' rotary dryer Micropul model 760 J-10-TRH C, dust collector; Symons Sand & Rock Screening System, aggregate & sand storage, transfer & weigh system, with water spray dust control; Liquidasphalt Storage, transfer & weigh system.

UNIT TESTED: Baghouse

SITE PERSONNEL:	Jeff Ordones	
APCD PERSONNEL:	Tracy Prevo, Ben Morris, Andy Segal and John Jackson	
REPORT BY:	J.Jackson	DATE: 07 FEBRUARY 1990
APPROVED BY:	C W Ridenour	DATE: 2/8/90

C.W. RIDENOUR
SENIOR AIR POLLUTION CHEMIST

PARAMETERS:	MEASURED:
STACK GAS FLOW RATE (DSCFM):	26,441
STACK GAS TEMPERATURE °F (AVG):	169
PRODUCTION RATE (AVG):	257 Ton/hr

RESULTS:

TEST	PERMIT LIMIT	MEASURED PARTICULATE	PERFORMANCE
RULE 54 DUST AND FUME	40.00 lbs/hr	4.7 lbs/hr	PASS
RULE 21 PERMIT CONDITIONS	0.04 gr/dscf	0.021 gr/dscf	PASS

TEST REFERENCE:
San Diego Air Pollution Control District Quality Assurance Manual Method 5 for Particulate Emissions from Stationary Sources.

TEST DESCRIPTION

Introduction:
This report presents the results of particulate loading and gas volume tests at Industrial Asphalt, Mission Valley The test was performed on a baghouse stack serving the hot mix plant. **THIS WAS A RETEST.**

System Description:
This asphalt plant combines crushed rock and sand with hot asphalt oil in batch loads of varying sizes. The rock and sand are dried in a rotary drier which is heated by natural gas. The exhaust from this drier is pulled through a baghouse, the emissions to the atmosphere from this baghouse are the subject of this report.

Procedures:
The procedures and equipment utilized in performing these tests are based on EPA New Source Performance Standards Method 5. The sampling train was modified to exclude the front-end filter and include a back-end filter, per the San Diego Air Pollution Control District Method 5 testing guidelines. The calculations were designed to include the impinger catch so that the test results can be compared to Rule 54 of SDAPCD.

Velocity Traverse:
Prior information regarding the stack velocity profile eliminated the need for a separate exploratory traverse. Temperature and pitot tube data collected during actual sampling were used to calculate stack volume.

Particulate Sampling:
This sample consisted of 24 traverse points, 12 pts. from each of 2 sample ports as shown in Figure 1&2. The sample was collected 67 inches below the top of the stack. Field data associated with sample collection has been transferred to computer printout and is shown in the report. Calculations were done by computer and are also shown within the report.

Gas Analysis:
An integrated bag sample was collected on site and measured. The oxygen and carbon dioxide content of the stack gas was measured using a Teledyne model #320P-4 serial # 66676, and an Anarad gas analyzer model # AR-400, serial# 305, respectively, as per Method 3 in SDAPCD test guidelines.

SITE Industrial Asphalt, Mission Valley OPERATOR J.Jackson

TEST DATE: 24 JANUARY 1990 TEST #: 90024

DATA SUMMARY: *

TRAVERSE POINT NUMBER	GAS METER READING (Vm), ft3	PRESS. DIFF. ACROSS PITOT TUBES	PRESS. DIFF. ACROSS ORIF. ACTUAL	DRY GAS METER TEMPERATURE		STACK TEMP	IMP. TEMP	STACK FLOW (velocity)
				INLET	OUTLET			
	670.000							
1		1.75	1.66	59	66	147	52	83
2		1.93	1.83	59	84	149	39	87
3		1.90	1.80	59	89	150	40	87
4		1.85	1.76	59	91	165	39	86
5		1.86	1.77	59	93	167	40	87
6		1.80	1.71	60	95	167	40	85
7		1.86	1.77	60	95	168	40	87
8		1.88	1.71	61	96	169	43	87
9		2.12	2.01	61	96	172	43	93
10		2.20	2.09	62	96	177	43	95
11		1.60	1.52	62	96	171	44	81
12		1.20	1.14	63	98	170	44	70
13		1.70	1.61	65	83	175	46	84
14		2.25	2.13	65	94	179	43	96
15		2.45	2.33	65	98	183	42	101
16		2.60	2.47	65	100	184	44	104
17		2.50	2.38	66	101	183	44	102
18		2.35	2.25	72	90	169	48	98
19		2.25	2.14	73	94	171	47	96
20		1.60	1.52	74	99	169	46	81
21		1.52	1.44	75	103	169	47	79
22		1.40	1.33	76	106	171	48	76
23		1.20	1.14	77	108	170	48	70
24	712.914	0.81	0.77	78	109	158	49	57

* Pressures are in inches of water, temperatures are in degrees Fahrenheit, velocities are in ft/sec. All measurements are actual -uncorrected- values.

Average:	Vm	ΔP	ΔH	t1	t2	ts	ti	vs
	42.914	1.86	1.76	66	95	169	44	86

DATA SUMMARY:

PRESSURES

P bar 30.0 in Hg

P static -3.00 in H2O

Ps 29.8 in Hg

AVERAGE TEMPERATURES

ts = 169 F

tm = 1/2(ave.t1+ave.t2) = 80 F

ti = 44 F

VOLUMES

Vm, meter 42.914 cu ft

Vlc, impingers 230.8 ml

VAPOR PRESSURES

Vpw @ stack = 11.92 inHg

Vpw @ imp = 0.29 inHg

METER BOX PARAMETERS

ΔH@ = 1.93 inH2O

ΔP = 1.86 inH2O

ΔH = 1.76 inH2O

METER BOX I.D.# C138

NOZZLE AND PROBE

Dn = 0.204 in

An = Dn^2*π/4 = .0325 sq in

Cp = 0.840

Y = .9822

STACK MEASUREMENTS

%CO2 3.90

%CO 0.00

%O2 13.50

%N2 82.60

ø = sampling time 60 minutes

mn=particulate collect'd 0.0558 grams

STACK PARAMETERS

Stack Diameter = 3.17 ft

Ao=Area stack = 7.89 sq ft

CALCULATIONS

				EQUATION NUMBER
Vm std = Vm*Y*Tstd*Pm/(Pstd*Tm)	=	40.96	ft^3	1
Pm= Pbar+(ΔH/13.6)= corrected pressure of meter	=	30.12	in Hg	2
Tm=(avg t1+avg t2)/2+ 460	=	540.3	°R	3
Ts = absolute stack temperature = 460 + ts	=	628.9	°R	4
Ps= Pbar + (P static/13.6)	=	29.77	in Hg	5
Vw std =Vlc*∂*R*Tstd/(Pstd*Md)	=	11.00	ft^3	6
Bws = moisture =Vw std/(Vw std+Vm std)	=	0.2133		7
mn= grams of particulate (from laboratory sheet)	=	0.0558	grams	8
Cs = grain loading (dry) =15.43*mn/Vm std	=	0.0210	grains/dscf	9

GAS ANALYSIS

component	gas comp.	Bws	Mw g/g*mole	Mw wet
H2O	21.33%	0.2133	18	3.84
		1 - Bws		
Oxygen	13.5%	0.7867	32	3.40
Carbon monoxide	0.0%	0.7867	28	0.00
Carbon dioxide	3.9%	0.7867	44	1.35
N2 + inerts	82.6%	0.7867	28	18.32

Md = average dry molecular weight	(g/g*mol)=	26.91
vs= 85.49*Cp*((Ts*ΔP)/(Ps*Ms))^.5	(ft/s)=	86.30
Qs = stack flow rate = vs*Ao*60	(acfm)=	40,853
Qstd =17.38*Qs*(1-Bws)*Ps/Ts =flow rate at STP	(dscfm)=	26,441
I = 144*100*Ts*(.002669*Vlc+(Vm/Tm)*Pm)/(60*ø*vs*Ps*An) =isokinetic rate	(%) =	90.61
E = particulate emission rate = (0.00847)*(Qstd)*Cs	(lbs/hr) =	4.70

SUMMARY OF CALCULATIONS

I = % isokinetics = 90.6 %

Cs = grain loading (dry) = 0.021 grains/dscf

E = particulate emission rate = 4.70 lbs/hr

% CO2 = 3.90 %

C12 = grain loading at 12% CO2
= (12)*(Cs)/%CO2 = 0.065 grains/dscf

$$\% \text{ Excess Air} = \frac{(\%O2 - \%CO) * 100}{(.264(\%N2) - (\%O2) - 0.5(\%CO))} = 162.5 \%$$

NOMENCLATURE: cont.

Md = dry stack gas molecular weight = 0.32*%O2+0.44*%CO2+0.28(100-%O2-%CO2)
= (g/g*mole)

vs = stack vel. =85.49*(((Md*Pbar/(Ts*ΔP))^.5)*Cp*(ΔP^.5)*(Ts/(Ps*Ms))^.5
= (ft/s)

I = isokinetics = 144*100*Ts*(.002669*Vlc+Vm/Tm)*Pm/(60*Ø*vs*Ps*An) = (%)

Qs = flow rate = v std*Ao*60 = (acfm)

Qstd = flow rate at standard conditions = 17.38*Qs*(1-Bws)*Ps/Ts = (dscfm)

Ao = stack area = stack diameter^2*π/4 if round; length *width if rectanglar = (ft^2)

E = particulate emissions rate = 0.00847*Cs*Qstd = (lbs/hr)

* = multiplication

/ = division

^ = exponentiation

- for all constants not defined consult Code of Federal Regulations 40, pt.60,App A, Meth. 5.

APCD ENGINEERING OBSERVATION REPORT

APCD Test No.: 90024 Test Date: January 24, 1990

Site: Industrial Asphalt, Inc.
8150 Friars Road
San Diego, CA 92108

P/O No.: 30431

Engineer: Andrew Segal

I. Asphalt Composition for a 4 Ton Batch

	Sheet Mix	3/8" Fine	3/8" Fine	3/8" Berm
Bin #1 Sand & Dust	7,364 lbs	5,596 lbs	5,596 lbs	4,852 lbs
Bin #2 3/8" Rock	---	1,872 lbs	1,872 lbs	2,616 lbs
Asphalt Oil	636 lbs 8,000 lbs (AR4000)	532 lbs 8,000 lbs (AR4000)	532 lbs 8,000 lbs (AR8000)	532 lbs 8,000 lbs (AR8000)
	3/8" Reg.	3/8" Reg.	3/4" Reg.	3/4" Reg.
Bin #1 Sand & Dust	4,884 lbs	4,884 lbs	3,140 lbs	3,140 lbs
Bin #2 3/8" Rock	2,632 lbs	2,632 lbs	1,516 lbs	1,516 lbs.
Bin #3 1/2" Rock	---	---	1,516 lbs	1,516 lbs
Bin #4 3/4" Rock	---	---	1,400 lbs	1,400 lbs
Asphalt Oil	484 lbs 8,000 lbs (AR4000)	484 lbs 8,000 lbs (AR8000)	428 lbs 8,000 lbs (AR4000)	428 lbs 8,000 lbs (AR8000)
	City Sheet	3/8" City	3/4" City	1/2" State Max. Med.
Bin #1 Sand & Dust	7,308 lbs	4,480 lbs	3,132 lbs	3,768 lbs
Bin #2 3/8" Rock	---	2,988 lbs	1,512 lbs	1,884 lbs
Bin #3 1/2" Rock	---	---	1,512 lbs	---
Bin #4 3/4" Rock	---	---	1,396 lbs	---
Asphalt Oil	173 lbs 8,000 lbs	532 lbs 8,000 lbs	448 lbs 8,000 lbs	464 lbs 8,000 lbs

II. Asphalt Production/Operational Data During Sampling Tests

Time	Test Pt.	Material Temp ° F	Baghouse ΔP" H_2O	Fan ΔP" H_2O	Damper Pos. %	Burner Pos. %	Remarks
0730							Start Production count
0740	N-1						Start Test
0810	N-12						Traverse complete
0816	E-1						Start traverse
0822	E-3	311	2.8	---	---	---	
0827	E-5						No V.E. stack
0950							Plt. shut-down
1000	E-5						Plt. startup
1006		311	3.4	.23	24	44	Start test No V.E. at dryer rotary seals
1019	E-12						End test
1020		317	3.4	.24	22	44	Plt. shut-down

Production Time: 0730 - 0827 = 57 minutes
0950 - 1020 = 30 minutes
87 minutes (1.45 hours)

Production:

Mix No.	Name	Tons
1	Sheet AR4000	4.51
3	3/8" Fine AR4000	11.96
4	3/8" Fine AR8000	22.05
5	3/8" Berm AR8000	2.02
6	3/8" Reg AR4000	42.54
7	3/8" Reg AR8000	66.03
10	3/4" Reg AR4000	52.55
11	3/4" Reg AR8000	11.08
16	City Sheet AR4000	17.54
17	3/8" City AR4000	4.52
19	3/4" City AR4000	36.96
29	1/2" State Max. Med. AR8000	100.17
	Total	371.93

Average Production Rate: 371.93 tons/1.45 hours = 256.5 tons/hr

Comments

1. This test was conducted by the San Diego Air Pollution Control District (APCD) Source Test Team.

2. The baghouse exhaust stack was evaluated for APCD Rule 54 particulate emissions (40 lbs/hr maximum), NSPS rule 260.12 (.04 grains/DSCF maximum) and visible emissions.

3. The sampling time was 2.5 minutes per point, and 12 points per traverse for each port for a total of 24 test points. (Circular exhaust stack)

4. The "blue smoke" and dust emissions at the plant truck drop area was 40% opacity or less, except for one observance of 60% opacity for a 5 second time period. No visible emissions were observed at the truck loading tunnel entrance or exit. The silo loadout equipment was not used during the time of the test.

5. There were no visible particulate emissions observed at the baghouse exhaust stack. An intense white steam plume rose directly up from the exhaust stack. There were no visible emissions observed at the rotary dryer seals. The asphalt plant was in compliance with the visible emission requirements of APCD Rule 50 and Rule 260.92.

6. The rotary dryer was fired with natural gas.

Andrew Segal

ANDREW SEGAL
Associate Air Pollution Control Engineer

AS:jl

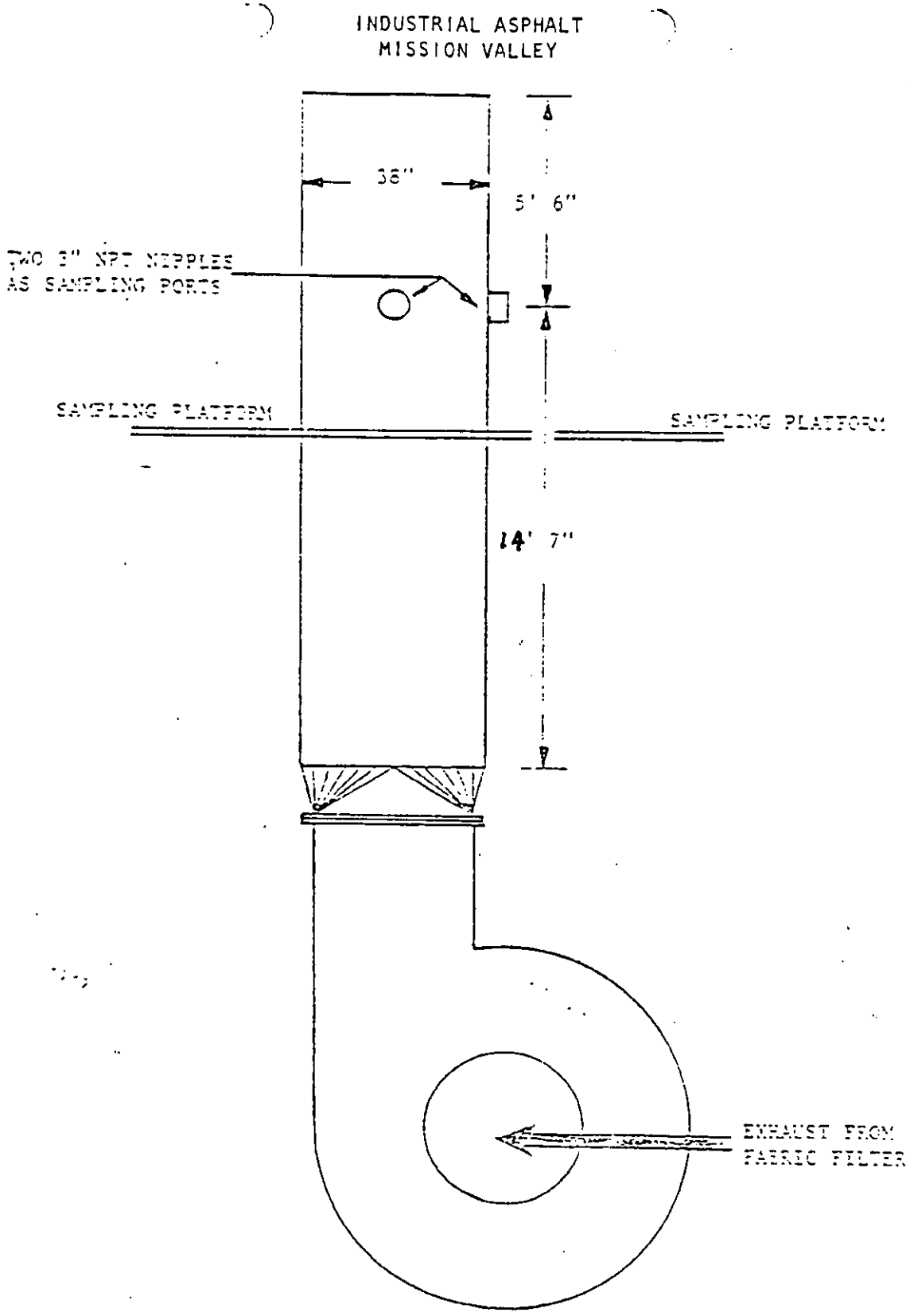
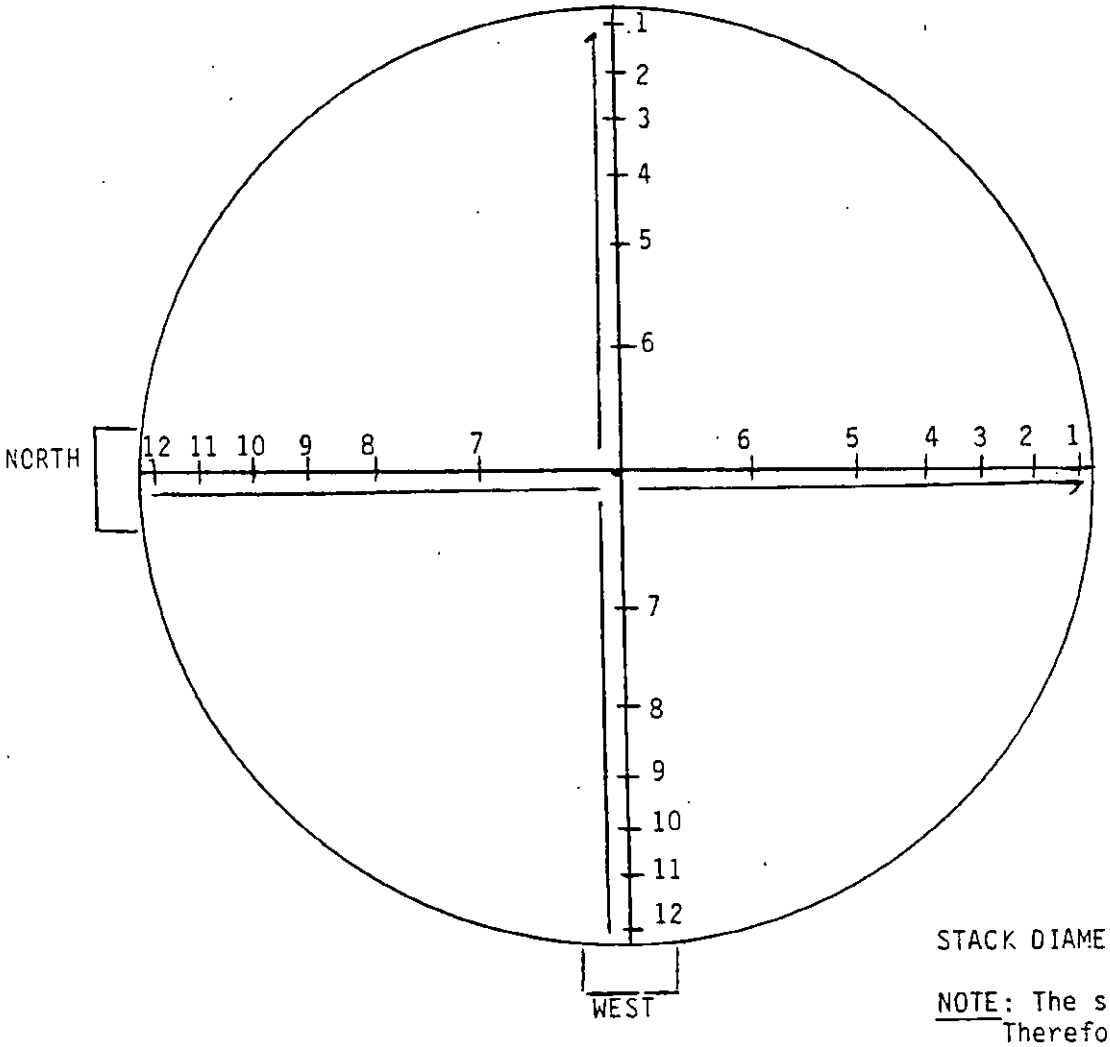


FIG:2 SITE DESCRIPTION

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

INDUSTRIAL ASPHALT, MISSION VALLEY

TRAVERSE POINTS



STACK DIAMETER = 38"

NOTE: The stack is oblong by 2". Therefore, on E-W traverse points 1 & 2 and 11 & 12 were combined.

POINT #	DISTANCE INTO STACK
1	0.8 in.
2	2.5
3	4.5
4	6.7
5	9.5
6	13.5
7	24.5
8	28.5
9	31.3
10	33.5
11	35.5
12	37.2

FIGURE 1.

NOMENCLATURE:

Pstd = pressure at standard condition = (29.92 in. Hg)
Tstd = temperature at standard conditions = (528°R)
Pbar = barometric pressure = (in Hg)
Pstatic = stack static pressure = (in Hg)
Ps = Absolute stack pressure = Pbar +(Pstatic/13.6) = (in Hg)
t1 = dry gas meter inlet temperature = (°F)
t2 = dry gas meter outlet temperature = (°F)
ts = stack temperature = (°F)
Ts = stack temperature = (°R)
Tm = dry gas meter temperature =(t1+t2)/2 +460 = (°R)
ti = Impinger out temperature = (°F)
vs = stack gas velocity = 85.49*Cp*(Ts*ΔP/(Ps*Ms))^.5 = (ft/s)
Ms = stack gas molecular weight = Md*(1-Bws)+Bws*18 = (g/g*mole)
Vm = sample gas volume, uncorrected = (cu ft)
Vlc = collected water,impingers = (ml)
Vpw = Vapor pressure of water = (in Hg)
ΔH @ = orifice pressure differential that equates to 0.75 cfm of air @ 68ºF and 29.92 in Hg
= (in Hg*cu ft/°R)

ΔP = (summation (press.diff. across pitot tubes^.5)/number entries)^2 = (in H2O)
ΔH = average differential pressure across the orifice = (In H2O)
Dn = nozzle diameter = (in)
An = nozzle area = π*Dn^2/4 = (in^2)
Cp = pitot tube coefficient = (dimensionless)
Y = meter box coefficient = (dimensionless)
CO2 = carbon dioxide = (%)
O2 = oxygen = (%)
CO = carbon monoxide = (%)
N2 = nitrogen = (%)
Ao = stack area = (ft^2)
ø = sampling time = (minutes)
corrVwm= water volume correction at meter w/o silica gel
Corr Vwm =(Vm*Ms*Pm/(R*Tm))*(.04747) = (ft^3)
Vm std = corrected volume of meter = Vm*Y*T std*Pm/(Pstd*Tm) = (ft^3)
Pm = absolute meter pressure = Pbar+(ΔH/13.6) = (in Hg)
Vw std = water volume at STP = Vlc*∂*R*Tstd/(Pstd*Md) = (ft^3)
∂ = density of water at STP = 0.002201 = (lb/ml)
Mw = molecular weight = (grams/mole)
R = ideal gas constant = 21.85 in. Hg*ft^3/°R*lb*mole
Bws = fractional stack gas moisture content = Vw std/(Vwstd+ Vm std) = (%/100)
mn = particulate found in sample train = (grams)
Cs = grain loading = 15.430*mn/Vm std = (grains/dscf)

SDC APCD METHOD 5 LAB SHEET

SITE = INDUSTRIAL ASPHALT, MISSION VALLEY

TEST # = 90024

VOLUMES

(1) IMPINGER VOLUMES

	final			initial			Δ
#1	742.6	ml	-	552.0	ml	=	190.6
#2	574.2	ml	-	538.8	ml	=	35.4
#3	462.1	ml	-	457.9	ml	=	4.2
#4	450	ml	-	449.4	ml	=	0.6

TOTAL VOLUME LIQUID COLLECTED = 230.8

comments: Front-half and back-half rinses were combined in one beaker.
Acetone used: EM Science, OMNISOLV, glass distilled, Lot #8301.
Water used: APCD lab deionized water.
Black-brown particles seen in acetone rinse & some in water rinse.
Filter had a few, dark, small particles visible.
Recovery done by J. Jackson & T. Wood.

(2) BEAKER RINSES

ACETONE			**WATER**		
BKR ID =	115		BKR ID =	113	
FRONT HALF =	100	ml	FRONT HALF =	100	ml
BACK HALF =	0	ml	BACK HALF =	0	ml
BEAKER RINSES =	330	ml	BEAKER RINSES =	400	ml
			IMPINGERS =	200	ml
total acetone =	430.0	ml	total water =	700.0	ml

* All data and calculations may be found on file at the San Diego County Air Pollution Control District.