PORSF
11.3.18.1 v2

PERFORMANCE TEST REPORT

JOHN ZINK CARBON ADSORPTION VAPOR RECOVERY UNIT
INSTALLED AT THE KMLT WILLBRIDGE TERMINAL
IN PORTLAND, OREGON

TEST DATE: APRIL 19, 2007

TANK TRUCK AND MARINE LOADING TEST

Prepared for:

KINDER MORGAN ENERGY PARTNERS, LP
1100 TOWN AND COUNTRY ROAD
ORANGE, CA 92868

USEPA SF
1288091

VOC Testing Inc.
ENVIRONMENTAL TESTING
AND EVALUATION

P.O. Box 5892 • San Bernardino, CA 92412 • (909) 381-4664 - FAX (909) 381-4967

Table of Contents

Section		Page
1.0	Introduction	1-1
2.0	Test Results	2-1
3.0	Process Description	3-1
4.0	Testing Procedures	4-1
	Test Critique	4-2
	Appendix	
A	Field Data & Calculations	A-1
B	Calibration Data	B-1
C	Test Methods	C-1

1.0 Introduction

On April 19, 2007 personnel of VOC Testing, Inc. conducted a performance test of the John Zink carbon adsorption vapor recovery system installed at the Liquid Terminals, LLC (KMLT) Willbridge Terminal in Portland, Oregon. The testing entailed the continuous monitoring of the inlet and outlet hydrocarbon concentration, exhaust volume, temperature, and pressure of the vapor recovery system. The testing was done to include the processed effluent of more than 80,000 gallons of gasoline vapors over a period of more than six hours. Gasoline loading included barge loading and loading of tank trucks at the loading rack.

This report presents the results of the performance test, and describes the equipment and procedures used.

2.0 Test Results

The results of the performance test conducted on April 19, 2007 at the KMLT Willbridge Terminal in Portland, Oregon are summarized in Table 1.

The raw data and calculations supporting these results can be found in Appendix A.

Table 1

Mass Emission Rate Determination

Test Time	6:55 a.m. - 1:45 p.m.
Volume of Gasoline Loaded	1,210,519 gal. (4,581,814 l.)
VRU Exhaust Volume	2,34,390 SCF (6,638 Nm^3)
Average Outlet Concentration (NMHC)	0.066 % by volume as C_3
Outlet Mass Emission (NMHC)	18.07lbs (8.2 kg)
Mass Emission Rate	0.015 lbs/1000 gal.(1.8 mg/l)

3.0 Process Description

During marine loading, gasoline vapors are conveyed through a 10" vapor line from the dock to the vapor recovery unit using a blower. The vapor recovery system also receives displaced vapor from tank trucks being loaded at the terminal loading rack. The vapors going to the vapor recovery unit are passed through one of the two carbon beds where the hydrocarbon constituents are adsorbed on the carbon and the nonhydrocarbon fraction is vented to the atmosphere.

The activated carbon in each of the carbon beds is regenerated every fifteen minutes. After a bed completes fifteen minutes of vapor processing, the vapor stream is diverted to the other carbon bed and the spent bed goes through a regeneration cycle. Regeneration of the activated carbon is accomplished by subjecting it to a vacuum of 27-28 inches of mercury vacuum. The vacuum causes the adsorbed hydrocarbons to volatilize from the carbon. The desorbed hydrocarbons are pumped through an absorbing column where they are brought into contact with chilled gasoline and absorbed. The remaining air/vapor mixture is then passed through the on-line carbon bed to remove remaining hydrocarbons before venting to the atmosphere.

4.0 Testing Procedures

Emission Analysis

An eight inch Rockwell T-60 turbine meter and two six inch Rockwell T-30 turbine meters were attached to the exhaust stack using flex tubing to measure the exhaust gas volume of the vapor recovery unit (VRU. This was done to minimize the amount of backpressure caused by the flow meters. The temperature of the exhaust gas was measured with a type K thermocouple at the outlet of the gas meter. The pressure of the meter was measured at the inlet of the meters with a 0-2" of water magnehelic gauge. The exhaust gas volume was monitored in accordance with EPA Method 2a, "Direct Measurement of Gas Volume Through Pipes and Small Ducts."

The outlet gas sample was drawn from the exhaust stack through a 1/4'' teflon sample line and a teflon diaphragm pump. The gas sample from the VRU was analyzed continuously with a Horiba PIR2000 total hydrocarbon analyzer equipped with a nondispersive infrared detector. The analyzer was calibrated with certified standard gases of propane in nitrogen of 0.75%, 1.26%, and 2.006%. The outlet gas analysis was performed in accordance with EPA Method 25B "Determination of Total Gaseous Organic Concentration Using a Nondispersive Infrared Analyzer". This method and Method 2a are also included in Appendix C. The sample line was leak tested at the end of the test by introducing span gas through the end of the sample line. No leakage was detected. The sample line was checked for condensation during the test and none was detected.

Operation Analysis

Prior to the test, the vapor recovery system piping, flanges and valves were leak tested with a RKI Eagle explosimeter calibrated with 1.0% methane in air. No Leaks were identified during leak testing.

The barge was gauged at the beginning and end of the source test to determine the volume of gasoline that was loaded during the test. Volume loaded at the loading rack was taken from meter readings.

During the test the backpressures at the loading rack were monitored continuously, with readings each five minutes, and instantaneous maximum readings noted for each five minute

interval. The number of loading arms in use, and the loading rate were also recorded.

Appendix A

Field Data

KINDER MORGAN, WILLBRIDGE MARINE VRU 4/19/07
JOHN ZINK CARBON ADSORPTION VAPOR RECOVERY UNIT
BAROMETRIC PRESSURE= 30.01

TIME	6"METER VOLUME CUMM.	6"METER VOLUME CUMM.	8"METER VOLUME CUMM.	VOLUME INCREM	CONC. % NMHC	TM DEG. F	PM IN. HG	VOLUME STANDARD SCF	OUTLET MASS,LBS NMHC
655	13000	26100	70430	0	0	42	30.02	0	0
700	14000	28000	72270	4740	0.015	43	30.02	4992	0.0857942
705	14600	29500	74110	3940	0.028	43	30.02	4150	0.1331198
710	15000	29900	75880	2570	0.02	43	30.02	2707	0.0620228
715	15600	31300	75900	2020	0.015	43	30.02	2127	0.0365621
720	16100	32300	76820	2420	0.033	43	30.02	2549	0.0963646
725	16700	33600	78170	3250	0.015	43	30.02	3423	0.0588251
730	17100	34600	79540	2770	0.053	45	30.02	2906	0.1764495
735	17500	35500	79787	1547	0.103	45	30.02	1623	0.1915104
740	18100	36900	81280	3493	0.118	45	30.02	3664	0.495388
745	18200	37100	81800	820	0.068	45	29.96	858	0.0668835
750	18600	38100	82490	2090	0.039	45	29.96	2188	0.0977703
755	19400	39900	83785	3895	0.053	46	29.96	4070	0.247127
800	20100	41600	85080	3695	0.077	46	29.96	3861	0.340598
805	20700	43000	87130	4050	0.031	47	29.96	4223	0.1500017
810	21000	43600	88050	1820	0.04	49	29.96	1890	0.0866365
815	21500	44600	89030	2480	0.022	51	29.96	2566	0.0646757
820	22300	46400	90530	4100	0.031	54	29.96	4217	0.1497855
825	22700	47200	91450	2120	0.073	55	29.96	2176	0.1820283
830	23400	48800	93030	3880	0.03	56	29.96	3976	0.136644
835	23800	50000	94090	2660	0.03	57	29.96	2720	0.0934974
840	24400	51000	95000	2510	0.024	59	29.96	2557	0.070308
845	25100	52600	96690	3990	0.196	56	29.96	4088	0.9180507
850	25700	53900	98170	3380	0.098	56	29.96	3463	0.3888485
855	26400	55300	99500	3430	0.076	55	29.96	3521	0.3066111
900	26700	56000	100300	1800	0.049	59	29.96	1834	0.1029411
905	27000	57100	101220	2320	0.047	56	29.96	2377	0.128004
910	27700	58500	102445	3325	0.034	56	29.96	3407	0.1327114
915	28000	59200	103670	2225	0.067	55	29.96	2284	0.1753416
920	28600	60600	105000	3330	0.057	54	29.96	3425	0.2236884
925	29100	61700	106370	2970	0.043	54	29.96	3055	0.1505044
930	29600	62700	107180	2310	0.094	56	29.96	2367	0.2549045
935	30100	63800	108470	2890	0.031	58	29.96	2950	0.1047652
940	30600	64800	109450	2480	0.066	60	29.96	2522	0.1906688
945	31000	65800	110795	2745	0.074	60	29.96	2791	0.2366236
950	31400	67000	112140	2945	0.044	62	30.04	2991	0.1507693
955	32000	68300	112920	5625	0.054	64	30.04	5691	0.3520712
1000	32700	69700	113700	2880	0.037	65	30.04	2908	0.1232765
1005	33300	71100	116140	4440	0.071	65	30.04	4483	0.3646931
1010	34000	72300	117150	2910	0.089	65	30.04	2938	0.2996189
1015	34700	74000	118020	3270	0.041	66	30.04	3296	0.1548073
1020	35200	75000	119150	2630	0.039	66	30.04	2651	0.118435
1025	35900	76400	120600	3550	0.194	67	30.04	3571	0.7937157
1030	36300	77400	121600	2400	0.072	68	30.04	2410	0.1987721
1035	36800	78500	123000	3000	0.111	67	30.04	3018	0.3837772
1040	37300	78600	124000	1600	0.059	69	30.04	1603	0.1083832
1045	37800	80500	125250	3650	0.064	70	30.04	3651	0.2676964
1050	38100	81500	126590	2640	0.053	70	30.04	2641	0.1603428
1055	38600	82400	127600	2410	0.058	70	30.04	2411	0.1601824
1100	39100	83500	128700	2700	0.094	70	30.04	2701	0.2908448
1105	39400	84300	129990	2390	0.039	71	30.04	2386	0.1066138
1110	39900	85400	131300	2910	0.055	71	30.04	2905	0.1830656
1115	40300	86400	132400	2500	0.05	71	30.04	2496	0.1429753

1120	40800	87500	134600	3800	0.243	70	30.04	3801	1.0581799
1125	41200	88600	135700	2600	0.083	70	30.04	2601	0.2472983
1130	41600	89700	135800	1600	0.055	67	30.04	1609	0.1014186
1135	42000	90600	137000	2500	0.053	69	30.04	2505	0.1521268
1140	42200	91100	137760	1460	0.049	70	30.04	1460	0.081982
1145	42400	91600	138500	1440	0.025	70	30.04	1440	0.0412546
1150	42700	91800	139360	1360	0.046	72	30.04	1355	0.0714218
1155	43100	92900	140610	2750	0.041	72	30.04	2740	0.1287213
1200	43500	93900	141780	2570	0.061	72	30.04	2561	0.1789768
1205	44000	94900	143150	2870	0.072	72	30.04	2860	0.235911
1210	44400	95900	143910	2160	0.045	72	30.04	2152	0.1109686
1215	44700	96700	145030	2220	0.08	72	30.04	2212	0.2027575
1220	45100	97700	146000	2370	0.195	71	30.04	2366	0.5286083
1225	45500	98600	147100	2400	0.056	70	30.04	2401	0.1540171
1230	45900	99400	148260	2360	0.082	70	30.04	2361	0.2217663
1235	46500	101300	149500	3740	0.045	70	30.04	3741	0.1928652
1240	47200	102200	150850	2950	0.075	70	30.04	2951	0.2535438
1245	47600	103300	151900	2550	0.071	70	30.04	2551	0.2074761
1250	48000	104300	152950	2450	0.055	70	30.04	2451	0.1544182
1255	48400	105300	154000	2450	0.08	70	30.04	2451	0.2246083
100	48900	106300	155100	2600	0.049	70	30.04	2601	0.1459954
105	49400	107500	156280	2880	0.077	70	30.04	2881	0.2541282
110	49900	108600	157400	2720	0.088	70	30.04	2721	0.2742971
115	50500	109600	158500	2700	0.058	70	30.04	2701	0.1794574
120	51300	111800	160390	4890	0.078	70	30.04	4891	0.4370923
125	51900	113000	161370	2780	0.136	70	30.04	2781	0.4332647
130	52500	114300	162720	3250	0.087	71	30.04	3245	0.3234101
135	53000	115300	163810	2590	0.112	71	30.04	2586	0.3317942
140	53600	116500	164900	2890	0.064	71	30.04	2885	0.2115577
145	53900	117400	165960	2260	0.092	71	30.04	2256	0.2378194
TTL/AVG				230675	0.066	62	30.01	234390	18.073

VOLUME OF GASOLINE LOADED = 1,210,519 GAL.
MASS EMISSION RATE= 0.015 LBS/1000 GAL.(1.8 mg/l)

24067565

VAPOR PROCESSOR PARAMETERS

SITE KM Willbridge TEST NO. _____ BAROMETER 30.02 DATE 4/19/07

	ON/OFF	TIME	VOLUME (ACF) INLET	VOLUME (ACF) OUTLET	VOLUME (SCF) INLET	VOLUME (SCF) OUTLET	PRESS.	TEMP.	CONC. (%) IN	CONC. (%) OUT	MASS (LBS) IN	MASS (LBS) OUT
000		650		000	2027220					MTR press		Max press at a to V
900		655		1500			0.5	40				
2000		600		3700			0.1	41				
2800		605		5500			0.5	41				12.5
3900		610		7600			0.1	41				
5000		615		9900			0.1	41		4		10
5600		620		11300			0.1	41				
6500		625		14000			0.1	41				~~10~~
7700		630		15500			0.1	41		5		12
8700		635		17500			0.1	41		2		6.5
9900		640		19900			0.1	42		2		6.5
11200		645		22500			0.4	41		6		15.5
12100		650		24300	add		0.2	42		2		6.0
Start Test ~~13000~~		655		26100	3rd Turbine c/o check		0.2	42	0.041	2		
14000		700		28000	72270		0.2	43	0.015	1.3		
14600		705		29500		74110 73880	0.2	43	0.028	1.3		5.0
15000		710		29900			0.2	43	0.02	1.7		5.0
15600		715		31300		75900	0.2	43	0.015			
16100		720		32300		76820	0.2	43	0.033	2.2		7.0
16700		725		33600		78170	0.2	43	0.015	1.3		
17100		730		34600		79540 79260	0.2	45	0.053	0.3		4.0
~~35500~~ 17500		735		~~17500~~ 35500		797870	0.2	45	0.103	0.3		4.0
18100		740		36900		81280	0.1	45	0.118	0.0		2.0
~~18200~~		~~745~~		~~37100~~		~~81880~~	~~0.1~~	~~45~~	0.~~[illegible]~~			~~2.0~~

VAPOR PROCESSOR PARAMETERS

SITE KM Willbridge TEST NO. _____ BAROMETER 29.96 DATE 4/19/07

ON/OFF (6")	TIME	VOLUME (ACF) INLET (8")	VOLUME (ACF) OUTLET (6")	VOLUME (SCF) INLET	VOLUME (SCF) OUTLET	PRESS.	TEMP.	CONC. (%) IN	CONC. (%) OUT	MASS (LBS) IN	MASS (LBS) OUT
18200	745	37100	81880			0.1	45		M+R press 2.3	0.068	70 inlet
18600	750	38100	82490			0.1	45		1.4	0.039	4.0
19400	755	39900	83785			0.2	46		2.81	0.053	9.0
20100	800	41600	85080			0.2	46		1.9	0.077	6.0
20700	805	43000	87130			0.2	47		0.8	0.031	2.0
21000	810	43600	88050			0.2	49		0.9	0.040	2.0
21500	815	44600	89030			0.2	51		2.5	0.022	7.5
22300	820	46400	90530			0.1	54		1.2	0.031	3.5
22700	825	47200	91450			0.1	55		0.9	0.073	2.0
23400	830	48800	93030			0.2	56		2.43	0.030	9.0
23800	835	50000	94090			0.1	57		1.6	0.030	4.0
24400	840	51000	95000			0.2	59		2.5	0.024	7.5
25100	845	52600	96690			0.2	56		1.2	0.196	3.0
25700	850	53900	98170			0.2	56		1.0	0.096	2.5
26400	855	55300	99500			0.2	55		2.4	0.076	7.0
26700	900	56000	100300			0.1	59		1.0	0.049	2.0
27000	905	57100	101220			0.2	56		2.7	0.047	8.0
27700	910	58500	102445			0.1	56		1.0	0.034	2.0
28000	915	59200	103670			0.1	55		1.0	0.067	1.5
28600	920	60600	105000			0.1	54		2.5	0.057	7.5
29100	925	61700	106370			0.1	54		1.1	0.043	2.0
29600	930	62700	107180			0.1	56		2.5	0.094	7.5
30100	935	63800	108470			0.1	58		1.0	0.031	3.0
30600	940	64800	109450			0.1	60		1.0	0.066	3.0
31000	945	65800	110795			0.1	60		2.1	0.074	6.0

VAPOR PROCESSOR PARAMETERS

SITE Km Wellbridge TEST NO. _____ BAROMETER 30.01 DATE 4/19/07

ON/OFF	TIME	VOLUME (ACF) INLET (64)	VOLUME (ACF) OUTLET (8")	VOLUME (SCF) INLET (6")	VOLUME (SCF) OUTLET	PRESS.	TEMP.	CONC. (%) IN	CONC. (%) OUT (MTR press)	MASS (LBS) IN	MASS (LBS) OUT (Inlet)
31400	950	67000	112140			0.1	62	0.044	1.3		2.5
32000	955	68300	112920			0.1	64	0.054	1.3		2.5
32700	1000	69700	113700			0.3	65	0.037	2.6		7.0
33300	1005	71100	116140			0.1	65	0.071	1.2		2.0
34000	1010	72300	117150			0.3	65	0.089	3.5		10.0
34700	1015	74000	118020			0.2	66	0.041	1.1		2.0
35200	1020	75000	119150			0.1	66	0.039	1.0		1.5
35900	1025	76400	120600			0.1	67	0.194	2.4		6.0
36300	1030	77400	121600			0.1	68	0.072	1.0		2.0
36800	1035	78500	123000			0.1	67	0.111	2.5		6.5
37300	1040	78600	124000			0.1	69	0.059	1.0		1.0
37800	1045	80500		125250		0.1	70	0.064	1.0		0.5
38100	1050	81500		126590		0.1	70	0.053	2.0		5.0
38600	1055	82400		127600		0.1	70	0.058	1.0		1.5
39100	1100	83500		128700		0.1	70	0.094	1.0		1.5
39400	1105	84300		129990		0.1	71	0.039	1.0		1.5
39900	1110	85400		131300		0.1	71	0.056	1.0		1.0
40300	1115	86400		132400		0.1	71	0.050	1.0		1.0
40800	1120	87500		134600		0.1	70	0.243	1.0		2.0
41200	1125	88600		135700		0.1	70	0.083	3.0		8.0
41600	1130	89700		135800		0.1	67	0.055	1.0		1.0
42000	1135	90600		137000		0.1	69	0.053	1.0		1.0
42200	1140	91100		137760		0.1	70	0.049	1.8		3.5
42400	1145	91600		138500		0.1	70	0.025	0.6		0.6
42700	1150	91800		139360		0.1	72	0.046	1.0		1.0

Barge off

Barge on

VAPOR PROCESSOR PARAMETERS

SITE KM Wellbridge TEST NO. _____ BAROMETER 30.04 DATE 4/19/06

6" ON/OFF	TIME	VOLUME (ACF) 8" INLET	VOLUME (ACF) 6" OUTLET	VOLUME (SCF) INLET	VOLUME (SCF) OUTLET	PRESS.	TEMP.	CONC. (%) IN (M+P press)	CONC. (%) OUT	MASS (LBS) IN	MASS (LBS) OUT (Inlet)
43100	1155	92900	140660			0.1	72	0.041	2.0		5.0
43500	1200	93900	141780			0.1	72	0.061	1.0		1.0
44000	1205	94900	143150			0.1	72	0.072	1.0		2.5
44400	1210	95900	143910			0.1	72	0.045	1.0		1.0
44700	1215	96700	145030			0.1	72	0.08	1.0		1.0
45100	1220	97700	146000			0.2	71	0.195	2.5		6.5
45500	1225	98600	147100			0.1	70	0.056	1.0		2.0
45900	1230	99400	148260			0.1	70	0.082	1.0		2.0
46300	1235	101300	149500			0.1	70	0.045	2.0		2.0
47200	1240	102200	150850			0.1	70	0.075	2.5		6.5
47600	1245	103300	151900			0.1	70	0.071	1.5		4.0
48000	1250	104300	152950			0.1	70	0.055	1.5		4.5
48400	1255	105300	154000			0.1	70	0.080	1.5		4.5
48900	100	106300	155100			0.1	71	0.049	1.1		2.5
49400	105	107500	156280			0.1	71	0.077	1.4		3.5
49900	110	108600	157400			0.1	70	0.088	1.4		3.5
50300	115	109600	158500			0.1	70	0.058	1.4		3.5
51300	120	111800	160390			0.1	70	0.078	2.4		6.5
51900	125	113000	161370			0.1	70	0.136	1.1		2.5
52500	130	114300	162720			0.1	71	0.087	1.3		3.5
53000	135	115300	163810			0.1	71	0.112	1.0		2.0
53600	140	116500	164900			0.1	71	0.064	1.0		2.0
53900	145	117400	165960			0.1	71	0.092	1.0		2.0

Logger Details:
Logger Type : 1F8
Serial Number : KS0430006
Controller Firmware : 1.1
Aquisition Firmware : 1.0
Logger ID : Logger ID

Job Details
Number of Analogue Channels : 3
Number of Digital Channels : 0
Total Number of Channels Used : 3

Arm Time : 4/19/2007 05:28:53
Disarm Time : 4/19/2007 13:52:16
Duration : 08:23:23
Job Description : VRU Test
Readings per Channel : 503

Channel Details

Description :	THC in % (	HCOUT (%	TM (DEG.F)
Sample Interval :	0:00:01	0:00:01	0:00:01
Logging Interval :	0:01:00	0:01:00	0:01:00

Date/Time	Type	THC in % (	HCOUT (%THC)
19/04/2007 06:50:55.100	Interval	10.2959	0.0444
19/04/2007 06:51:55.100	Interval	10.5087	0.044
19/04/2007 06:52:55.100	Interval	11.0107	0.0402
19/04/2007 06:53:55.100	Interval	10.596	0.0377
19/04/2007 06:54:55.100	Interval	9.6855	0.0363
AVERAGE		**10.41936**	**0.04052**
19/04/2007 06:55:55.100	Interval	9.1476	0.0244
19/04/2007 06:56:55.100	Interval	9.3827	0.0059
19/04/2007 06:57:55.100	Interval	9.8517	0.0154
19/04/2007 06:58:55.100	Interval	9.0944	0.0089
19/04/2007 06:59:55.100	Interval	10.2296	0.0219
AVERAGE		**9.5412**	**0.0153**
19/04/2007 07:00:55.100	Interval	9.8571	0.0246
19/04/2007 07:01:55.100	Interval	8.9864	0.0275
19/04/2007 07:02:55.100	Interval	8.8752	0.0317
19/04/2007 07:03:55.100	Interval	9.8669	0.0302
19/04/2007 07:04:55.100	Interval	10.0212	0.0263
AVERAGE		**9.52136**	**0.02806**
19/04/2007 07:05:55.100	Interval	11.0822	0.0252
19/04/2007 07:06:55.100	Interval	12.0224	0.0259
19/04/2007 07:07:55.100	Interval	12.3121	0.0289
19/04/2007 07:08:55.100	Interval	10.7615	0.0174
19/04/2007 07:09:55.100	Interval	9.9974	0.0017
AVERAGE		**11.23512**	**0.01982**
19/04/2007 07:10:55.100	Interval	12.7207	0.0166
19/04/2007 07:11:55.100	Interval	13.4165	0.008
19/04/2007 07:12:55.100	Interval	13.5883	0.0062
19/04/2007 07:13:55.100	Interval	13.6598	0.0185
19/04/2007 07:14:55.100	Interval	13.756	0.0233
AVERAGE		**13.42826**	**0.01452**
19/04/2007 07:15:55.100	Interval	13.8049	0.0257
19/04/2007 07:16:55.100	Interval	13.8338	0.0298
19/04/2007 07:17:55.100	Interval	13.2091	0.0343
19/04/2007 07:18:55.100	Interval	12.4285	0.0367

19/04/2007 07:19:55.100	Interval	12.792	0.0361
AVERAGE		**13.21366**	**0.03252**
19/04/2007 07:20:55.100	Interval	13.6371	0.0358
19/04/2007 07:21:55.100	Interval	11.6286	0.0131
19/04/2007 07:22:55.100	Interval	11.7707	0.0032
19/04/2007 07:23:55.100	Interval	11.247	0.0123
19/04/2007 07:24:55.100	Interval	14.2196	0.0092
AVERAGE		**12.5006**	**0.01472**
19/04/2007 07:25:55.100	Interval	18.8308	0.0193
19/04/2007 07:26:55.100	Interval	19.5285	0.0258
19/04/2007 07:27:55.100	Interval	19.997	0.046
19/04/2007 07:28:55.100	Interval	20.4458	0.0781
19/04/2007 07:29:55.100	Interval	20.1625	0.0974
AVERAGE		**19.79292**	**0.05332**
19/04/2007 07:30:55.100	Interval	18.9358	0.1078
19/04/2007 07:31:55.100	Interval	17.2824	0.1165
19/04/2007 07:32:55.100	Interval	16.874	0.1238
19/04/2007 07:33:55.100	Interval	15.3031	0.1287
19/04/2007 07:34:55.100	Interval	17.6486	0.0405
AVERAGE		**17.20878**	**0.10346**
19/04/2007 07:35:55.100	Interval	14.4053	0.0195
19/04/2007 07:36:55.100	Interval	14.5845	0.0433
19/04/2007 07:37:55.100	Interval	13.848	0.0296
19/04/2007 07:38:55.100	Interval	13.62	0.4416
19/04/2007 07:39:55.100	Interval	13.6751	0.0564
AVERAGE		**14.02658**	**0.11808**
19/04/2007 07:40:55.100	Interval	14.4928	0.076
19/04/2007 07:41:55.100	Interval	15.2013	0.0758
19/04/2007 07:42:55.100	Interval	15.3971	0.0661
19/04/2007 07:43:55.100	Interval	14.9113	0.0624
19/04/2007 07:44:55.100	Interval	14.5141	0.0591
AVERAGE		**14.90332**	**0.06788**
19/04/2007 07:45:55.100	Interval	14.7595	0.0582
19/04/2007 07:46:55.100	Interval	14.8152	0.0623
19/04/2007 07:47:55.100	Interval	14.8469	0.0233
19/04/2007 07:48:55.100	Interval	14.8194	0.0309
19/04/2007 07:49:55.100	Interval	14.8269	0.0223
AVERAGE		**14.81358**	**0.0394**
19/04/2007 07:50:55.100	Interval	14.8848	0.0255
19/04/2007 07:51:55.100	Interval	16.0936	0.0469
19/04/2007 07:52:55.100	Interval	16.7595	0.0534
19/04/2007 07:53:55.100	Interval	12.9253	0.0622
19/04/2007 07:54:55.100	Interval	12.2238	0.0793
AVERAGE		**14.5774**	**0.05346**
19/04/2007 07:55:55.100	Interval	11.6361	0.0861
19/04/2007 07:56:55.100	Interval	11.6082	0.0694
19/04/2007 07:57:55.100	Interval	12.284	0.0725
19/04/2007 07:58:55.100	Interval	12.5657	0.0772
19/04/2007 07:59:55.100	Interval	12.8783	0.0814
AVERAGE		**12.19446**	**0.07732**
19/04/2007 08:00:55.100	Interval	12.9046	0.0188
19/04/2007 08:01:55.100	Interval	13.0893	0.0448
19/04/2007 08:02:55.100	Interval	13.5243	0.0268
19/04/2007 08:03:55.100	Interval	13.8344	0.0223
19/04/2007 08:04:55.100	Interval	14.5497	0.0403
AVERAGE		**13.58046**	**0.0306**
19/04/2007 08:05:55.100	Interval	14.0963	0.0415
19/04/2007 08:06:55.100	Interval	13.4751	0.0386
19/04/2007 08:07:55.100	Interval	12.3912	0.0392
19/04/2007 08:08:55.100	Interval	13.7314	0.0407
19/04/2007 08:09:55.100	Interval	14.9141	0.0392

AVERAGE		**13.72162**	**0.03984**
19/04/2007 08:10:55.100	Interval	15.137	0.0353
19/04/2007 08:11:55.100	Interval	15.242	0.0319
19/04/2007 08:12:55.100	Interval	15.2696	0.0263
19/04/2007 08:13:55.100	Interval	14.9627	0.0007
19/04/2007 08:14:55.100	Interval	15.2434	0.0157
AVERAGE		**15.17094**	**0.02198**
19/04/2007 08:15:55.100	Interval	13.5863	0.0069
19/04/2007 08:16:55.100	Interval	13.4768	0.0221
19/04/2007 08:17:55.100	Interval	17.8429	0.0376
19/04/2007 08:18:55.100	Interval	17.9181	0.0391
19/04/2007 08:19:55.100	Interval	18.1769	0.0468
AVERAGE		**16.2002**	**0.0305**
19/04/2007 08:20:55.100	Interval	18.1236	0.0556
19/04/2007 08:21:55.100	Interval	17.296	0.0649
19/04/2007 08:22:55.100	Interval	18.0402	0.0733
19/04/2007 08:23:55.100	Interval	17.1358	0.0827
19/04/2007 08:24:55.100	Interval	15.348	0.0909
AVERAGE		**17.18872**	**0.07348**
19/04/2007 08:25:55.100	Interval	14.8778	0.0768
19/04/2007 08:26:55.100	Interval	14.7213	0.0078
19/04/2007 08:27:55.100	Interval	14.5342	0.0371
19/04/2007 08:28:55.100	Interval	14.0629	0.0155
19/04/2007 08:29:55.100	Interval	14.1654	0.0134
AVERAGE		**14.47232**	**0.03012**
19/04/2007 08:30:55.100	Interval	13.1827	0.0273
19/04/2007 08:31:55.100	Interval	13.3231	0.0297
19/04/2007 08:32:55.100	Interval	12.1738	0.0315
19/04/2007 08:33:55.100	Interval	11.926	0.0318
19/04/2007 08:34:55.100	Interval	12.0956	0.0303
AVERAGE		**12.54024**	**0.03012**
19/04/2007 08:35:55.100	Interval	11.9468	0.0359
19/04/2007 08:36:55.100	Interval	11.4649	0.0327
19/04/2007 08:37:55.100	Interval	12.0461	0.0301
19/04/2007 08:38:55.100	Interval	12.9962	0.0177
19/04/2007 08:39:55.100	Interval	13.8828	0.004
AVERAGE		**12.46736**	**0.02408**
19/04/2007 08:40:55.100	Interval	14.2399	0.2426
19/04/2007 08:41:55.100	Interval	14.5102	0.5832
19/04/2007 08:42:55.100	Interval	15.0737	0.0415
19/04/2007 08:43:55.100	Interval	15.7042	0.0516
19/04/2007 08:44:55.100	Interval	15.6112	0.059
AVERAGE		**15.02784**	**0.19558**
19/04/2007 08:45:55.100	Interval	15.5242	0.0666
19/04/2007 08:46:55.100	Interval	17.5425	0.0781
19/04/2007 08:47:55.100	Interval	18.7177	0.0931
19/04/2007 08:48:55.100	Interval	19.3408	0.1015
19/04/2007 08:49:55.100	Interval	18.8094	0.1234
AVERAGE		**17.98692**	**0.09254**
19/04/2007 08:50:55.100	Interval	17.4157	0.1421
19/04/2007 08:51:55.100	Interval	17.0552	0.0899
19/04/2007 08:52:55.100	Interval	17.1194	0.0464
19/04/2007 08:53:55.100	Interval	17.1713	0.0629
19/04/2007 08:54:55.100	Interval	16.3956	0.0405
AVERAGE		**17.03144**	**0.07636**
19/04/2007 08:55:55.100	Interval	16.2257	0.0388
19/04/2007 08:56:55.100	Interval	16.5307	0.0511
19/04/2007 08:57:55.100	Interval	16.3387	0.0524
19/04/2007 08:58:55.100	Interval	15.5603	0.052
19/04/2007 08:59:55.100	Interval	15.7148	0.0518
AVERAGE		**16.07404**	**0.04922**

19/04/2007 09:00:55.100	Interval	16.7428	0.0529
19/04/2007 09:01:55.100	Interval	17.1702	0.0522
19/04/2007 09:02:55.100	Interval	18.1044	0.0505
19/04/2007 09:03:55.100	Interval	18.3005	0.0491
19/04/2007 09:04:55.100	Interval	13.5632	0.0297
AVERAGE		**16.77622**	**0.04688**
19/04/2007 09:05:55.100	Interval	12.2489	0.0304
19/04/2007 09:06:55.100	Interval	12.1152	0.0266
19/04/2007 09:07:55.100	Interval	12.6377	0.0287
19/04/2007 09:08:55.100	Interval	13.3027	0.0403
19/04/2007 09:09:55.100	Interval	12.4588	0.0434
AVERAGE		**12.55266**	**0.03388**
19/04/2007 09:10:55.100	Interval	12.4276	0.0526
19/04/2007 09:11:55.100	Interval	13.7852	0.0635
19/04/2007 09:12:55.100	Interval	14.8415	0.0689
19/04/2007 09:13:55.100	Interval	15.0711	0.0728
19/04/2007 09:14:55.100	Interval	15.1775	0.0784
AVERAGE		**14.26058**	**0.06724**
19/04/2007 09:15:55.100	Interval	15.2435	0.0866
19/04/2007 09:16:55.100	Interval	14.9463	0.0984
19/04/2007 09:17:55.100	Interval	13.8043	0.0342
19/04/2007 09:18:55.100	Interval	13.6786	0.0397
19/04/2007 09:19:55.100	Interval	12.4857	0.0284
AVERAGE		**14.03168**	**0.05746**
19/04/2007 09:20:55.100	Interval	11.837	0.0194
19/04/2007 09:21:55.100	Interval	13.7011	0.0319
19/04/2007 09:22:55.100	Interval	13.9245	0.0316
19/04/2007 09:23:55.100	Interval	14.1036	0.0315
19/04/2007 09:24:55.100	Interval	14.9541	0.1013
AVERAGE		**13.70406**	**0.04314**
19/04/2007 09:25:55.100	Interval	15.0962	0.2752
19/04/2007 09:26:55.100	Interval	14.9836	0.0494
19/04/2007 09:27:55.100	Interval	14.4942	0.0484
19/04/2007 09:28:55.100	Interval	14.4012	0.0483
19/04/2007 09:29:55.100	Interval	14.3688	0.0487
AVERAGE		**14.6688**	**0.094**
19/04/2007 09:30:55.100	Interval	14.6334	0.0226
19/04/2007 09:31:55.100	Interval	14.39	0.0319
19/04/2007 09:32:55.100	Interval	14.3432	0.0264
19/04/2007 09:33:55.100	Interval	14.3724	0.0289
19/04/2007 09:34:55.100	Interval	14.4009	0.0445
AVERAGE		**14.42798**	**0.03086**
19/04/2007 09:35:55.100	Interval	15.7385	0.0508
19/04/2007 09:36:55.100	Interval	13.5089	0.0585
19/04/2007 09:37:55.100	Interval	12.5314	0.0677
19/04/2007 09:38:55.100	Interval	12.8236	0.0735
19/04/2007 09:39:55.100	Interval	13.403	0.0794
AVERAGE		**13.60108**	**0.06598**
19/04/2007 09:40:55.100	Interval	14.013	0.0887
19/04/2007 09:41:55.100	Interval	13.9294	0.0991
19/04/2007 09:42:55.100	Interval	13.8646	0.1052
19/04/2007 09:43:55.100	Interval	13.781	0.0253
19/04/2007 09:44:55.100	Interval	14.2577	0.0528
AVERAGE		**13.96914**	**0.07422**
19/04/2007 09:45:55.100	Interval	14.3766	0.0407
19/04/2007 09:46:55.100	Interval	14.419	0.0335
19/04/2007 09:47:55.100	Interval	14.334	0.042
19/04/2007 09:48:55.100	Interval	14.2732	0.0508
19/04/2007 09:49:55.100	Interval	13.87	0.0519
AVERAGE		**14.25456**	**0.04378**
19/04/2007 09:50:55.100	Interval	12.1301	0.0538

19/04/2007 09:51:55.100	Interval	11.0883	0.0557
19/04/2007 09:52:55.100	Interval	12.8672	0.0552
19/04/2007 09:53:55.100	Interval	13.8034	0.0528
19/04/2007 09:54:55.100	Interval	13.9946	0.0508
AVERAGE		**12.77672**	**0.05366**
19/04/2007 09:55:55.100	Interval	14.1664	0.0465
19/04/2007 09:56:55.100	Interval	14.4223	0.0245
19/04/2007 09:57:55.100	Interval	14.7076	0.0371
19/04/2007 09:58:55.100	Interval	15.9938	0.0299
19/04/2007 09:59:55.100	Interval	17.0184	0.0448
AVERAGE		**15.2617**	**0.03656**
19/04/2007 10:00:55.100	Interval	16.771	0.0531
19/04/2007 10:01:55.100	Interval	16.515	0.0616
19/04/2007 10:02:55.100	Interval	17.4132	0.0712
19/04/2007 10:03:55.100	Interval	16.9329	0.0812
19/04/2007 10:04:55.100	Interval	14.7423	0.0895
AVERAGE		**16.47488**	**0.07132**
19/04/2007 10:05:55.100	Interval	14.2411	0.0975
19/04/2007 10:06:55.100	Interval	13.817	0.1069
19/04/2007 10:07:55.100	Interval	11.3318	0.1147
19/04/2007 10:08:55.100	Interval	10.043	0.0898
19/04/2007 10:09:55.100	Interval	9.2093	0.0353
AVERAGE		**11.72844**	**0.08884**
19/04/2007 10:10:55.100	Interval	8.7388	0.0675
19/04/2007 10:11:55.100	Interval	8.9388	0.0339
19/04/2007 10:12:55.100	Interval	9.5487	0.0365
19/04/2007 10:13:55.100	Interval	10.7838	0.034
19/04/2007 10:14:55.100	Interval	12.1062	0.0336
AVERAGE		**10.02326**	**0.0411**
19/04/2007 10:15:55.100	Interval	12.8631	0.0348
19/04/2007 10:16:55.100	Interval	12.3387	0.0366
19/04/2007 10:17:55.100	Interval	13.7722	0.0392
19/04/2007 10:18:55.100	Interval	14.7352	0.0409
19/04/2007 10:19:55.100	Interval	16.5005	0.044
AVERAGE		**14.04194**	**0.0391**
19/04/2007 10:20:55.100	Interval	19.6409	0.0469
19/04/2007 10:21:55.100	Interval	20.1718	0.0633
19/04/2007 10:22:55.100	Interval	19.8007	0.7843
19/04/2007 10:23:55.100	Interval	18.8127	0.0401
19/04/2007 10:24:55.100	Interval	17.4789	0.0372
AVERAGE		**19.181**	**0.19436**
19/04/2007 10:25:55.100	Interval	15.7263	0.0549
19/04/2007 10:26:55.100	Interval	15.0209	0.0631
19/04/2007 10:27:55.100	Interval	14.3563	0.0711
19/04/2007 10:28:55.100	Interval	13.5904	0.0809
19/04/2007 10:29:55.100	Interval	13.3699	0.0907
AVERAGE		**14.41276**	**0.07214**
19/04/2007 10:30:55.100	Interval	12.5469	0.1021
19/04/2007 10:31:55.100	Interval	12.109	0.114
19/04/2007 10:32:55.100	Interval	12.7996	0.1251
19/04/2007 10:33:55.100	Interval	11.7551	0.1352
19/04/2007 10:34:55.100	Interval	13.5818	0.0776
AVERAGE		**12.55848**	**0.1108**
19/04/2007 10:35:55.100	Interval	18.3954	0.0648
19/04/2007 10:36:55.100	Interval	19.4892	0.0652
19/04/2007 10:37:55.100	Interval	19.1672	0.0456
19/04/2007 10:38:55.100	Interval	18.436	0.0562
19/04/2007 10:39:55.100	Interval	17.207	0.0635
AVERAGE		**18.53896**	**0.05906**
19/04/2007 10:40:55.100	Interval	16.0061	0.0622
19/04/2007 10:41:55.100	Interval	15.4872	0.0614

19/04/2007 10:42:55.100	Interval	15.2932	0.0631
19/04/2007 10:43:55.100	Interval	15.2002	0.0659
19/04/2007 10:44:55.100	Interval	15.1813	0.0679
AVERAGE		**15.4336**	**0.0641**
19/04/2007 10:45:55.100	Interval	15.1592	0.069
19/04/2007 10:46:55.100	Interval	15.1573	0.0702
19/04/2007 10:47:55.100	Interval	15.5855	0.0391
19/04/2007 10:48:55.100	Interval	15.3101	0.0471
19/04/2007 10:49:55.100	Interval	15.2075	0.0379
AVERAGE		**15.28392**	**0.05266**
19/04/2007 10:50:55.100	Interval	15.2136	0.0357
19/04/2007 10:51:55.100	Interval	15.2236	0.0521
19/04/2007 10:52:55.100	Interval	15.2309	0.0606
19/04/2007 10:53:55.100	Interval	15.2492	0.0663
19/04/2007 10:54:55.100	Interval	15.2625	0.0732
AVERAGE		**15.23596**	**0.05758**
19/04/2007 10:55:55.100	Interval	15.2461	0.0807
19/04/2007 10:56:55.100	Interval	15.2357	0.0866
19/04/2007 10:57:55.100	Interval	15.2564	0.0925
19/04/2007 10:58:55.100	Interval	15.2814	0.1009
19/04/2007 10:59:55.100	Interval	15.3156	0.1117
AVERAGE		**15.26704**	**0.09448**
19/04/2007 11:00:55.100	Interval	15.3853	0.0365
19/04/2007 11:01:55.100	Interval	15.3278	0.0495
19/04/2007 11:02:55.100	Interval	15.3098	0.0404
19/04/2007 11:03:55.100	Interval	15.3528	0.0319
19/04/2007 11:04:55.100	Interval	15.6146	0.0388
AVERAGE		**15.39806**	**0.03942**
19/04/2007 11:05:55.100	Interval	16.3312	0.0531
19/04/2007 11:06:55.100	Interval	16.2606	0.0559
19/04/2007 11:07:55.100	Interval	15.9023	0.0556
19/04/2007 11:08:55.100	Interval	15.718	0.0562
19/04/2007 11:09:55.100	Interval	14.7183	0.0563
AVERAGE		**15.78608**	**0.05542**
19/04/2007 11:10:55.100	Interval	14.7871	0.0563
19/04/2007 11:11:55.100	Interval	14.3652	0.065
19/04/2007 11:12:55.100	Interval	14.3442	0.0694
19/04/2007 11:13:55.100	Interval	14.5887	0.0173
19/04/2007 11:14:55.100	Interval	15.2017	0.0404
AVERAGE		**14.65738**	**0.04968**
19/04/2007 11:15:55.100	Interval	15.4009	0.7766
19/04/2007 11:16:55.100	Interval	15.5158	0.2927
19/04/2007 11:17:55.100	Interval	15.5523	0.0439
19/04/2007 11:18:55.100	Interval	15.5953	0.0488
19/04/2007 11:19:55.100	Interval	15.6027	0.0534
AVERAGE		**15.5334**	**0.24308**
19/04/2007 11:20:55.100	Interval	15.7006	0.0601
19/04/2007 11:21:55.100	Interval	17.9577	0.0683
19/04/2007 11:22:55.100	Interval	18.931	0.0778
19/04/2007 11:23:55.100	Interval	18.3183	0.0921
19/04/2007 11:24:55.100	Interval	17.402	0.1216
AVERAGE		**17.66192**	**0.08398**
19/04/2007 11:25:55.100	Interval	17.5736	0.1136
19/04/2007 11:26:55.100	Interval	17.6473	0.0233
19/04/2007 11:27:55.100	Interval	17.6856	0.0703
19/04/2007 11:28:55.100	Interval	17.1588	0.0384
19/04/2007 11:29:55.100	Interval	16.5846	0.0317
AVERAGE		**17.32998**	**0.05546**
19/04/2007 11:30:55.100	Interval	16.4605	0.0461
19/04/2007 11:31:55.100	Interval	16.2792	0.0528
19/04/2007 11:32:55.100	Interval	14.9688	0.0521

19/04/2007 11:33:55.100	Interval	14.8481	0.0543
19/04/2007 11:34:55.100	Interval	14.8352	0.0585
AVERAGE		**15.47836**	**0.05276**
19/04/2007 11:35:55.100	Interval	14.2338	0.0615
19/04/2007 11:36:55.100	Interval	15.3421	0.0616
19/04/2007 11:37:55.100	Interval	16.1614	0.0599
19/04/2007 11:38:55.100	Interval	15.7394	0.0485
19/04/2007 11:39:55.100	Interval	13.7368	0.0147
AVERAGE		**15.0427**	**0.04924**
19/04/2007 11:40:55.100	Interval	15.6767	0.0253
19/04/2007 11:41:55.100	Interval	16.5318	0.0256
19/04/2007 11:42:55.100	Interval	16.7533	0.0236
19/04/2007 11:43:55.100	Interval	16.8541	0.024
19/04/2007 11:44:55.100	Interval	17.0113	0.0275
AVERAGE		**16.56544**	**0.0252**
19/04/2007 11:45:55.100	Interval	14.397	0.0329
19/04/2007 11:46:55.100	Interval	9.9838	0.0402
19/04/2007 11:47:55.100	Interval	9.6906	0.0459
19/04/2007 11:48:55.100	Interval	10.5317	0.0509
19/04/2007 11:49:55.100	Interval	12.358	0.0583
AVERAGE		**11.39222**	**0.04564**
19/04/2007 11:50:55.100	Interval	12.1622	0.069
19/04/2007 11:51:55.100	Interval	12.6585	0.0508
19/04/2007 11:52:55.100	Interval	13.2955	0.0239
19/04/2007 11:53:55.100	Interval	12.1881	0.0324
19/04/2007 11:54:55.100	Interval	11.3044	0.0266
AVERAGE		**12.32174**	**0.04054**
19/04/2007 11:55:55.100	Interval	11.1619	0.0309
19/04/2007 11:56:55.100	Interval	10.4495	0.0563
19/04/2007 11:57:55.100	Interval	9.8374	0.067
19/04/2007 11:58:55.100	Interval	9.835	0.0718
19/04/2007 11:59:55.100	Interval	10.069	0.0772
AVERAGE		**10.27056**	**0.06064**
19/04/2007 12:00:55.100	Interval	10.3814	0.0799
19/04/2007 12:01:55.100	Interval	10.4934	0.0778
19/04/2007 12:02:55.100	Interval	10.7306	0.077
19/04/2007 12:03:55.100	Interval	11.1358	0.0781
19/04/2007 12:04:55.100	Interval	11.219	0.0472
AVERAGE		**10.79204**	**0.072**
19/04/2007 12:05:55.100	Interval	11.3234	0.0376
19/04/2007 12:06:55.100	Interval	11.4741	0.0365
19/04/2007 12:07:55.100	Interval	11.5625	0.0307
19/04/2007 12:08:55.100	Interval	11.5805	0.0528
19/04/2007 12:09:55.100	Interval	11.5946	0.067
AVERAGE		**11.50702**	**0.04492**
19/04/2007 12:10:55.100	Interval	11.5713	0.0726
19/04/2007 12:11:55.100	Interval	11.5873	0.0782
19/04/2007 12:12:55.100	Interval	11.6176	0.0827
19/04/2007 12:13:55.100	Interval	11.646	0.0835
19/04/2007 12:14:55.100	Interval	11.6349	0.0828
AVERAGE		**11.61142**	**0.07996**
19/04/2007 12:15:55.100	Interval	11.6094	0.0835
19/04/2007 12:16:55.100	Interval	11.6363	0.0863
19/04/2007 12:17:55.100	Interval	11.59	0.3753
19/04/2007 12:18:55.100	Interval	11.5904	0.3942
19/04/2007 12:19:55.100	Interval	11.569	0.0367
AVERAGE		**11.59902**	**0.1952**
19/04/2007 12:20:55.100	Interval	11.6386	0.0304
19/04/2007 12:21:55.100	Interval	11.6257	0.0408
19/04/2007 12:22:55.100	Interval	11.608	0.0644
19/04/2007 12:23:55.100	Interval	11.6261	0.0712

19/04/2007	12:24:55.100	Interval	11.5923	0.0751
AVERAGE			**11.61814**	**0.05638**
19/04/2007	12:25:55.100	Interval	11.6434	0.0798
19/04/2007	12:26:55.100	Interval	11.675	0.0825
19/04/2007	12:27:55.100	Interval	11.6483	0.0822
19/04/2007	12:28:55.100	Interval	11.5495	0.0817
19/04/2007	12:29:55.100	Interval	11.5599	0.0825
AVERAGE			**11.61522**	**0.08174**
19/04/2007	12:30:55.100	Interval	11.3754	0.0313
19/04/2007	12:31:55.100	Interval	11.2186	0.0449
19/04/2007	12:32:55.100	Interval	10.9552	0.0346
19/04/2007	12:33:55.100	Interval	10.3255	0.0459
19/04/2007	12:34:55.100	Interval	10.5224	0.0671
AVERAGE			**10.87942**	**0.04476**
19/04/2007	12:35:55.100	Interval	11.0104	0.0704
19/04/2007	12:36:55.100	Interval	10.9578	0.074
19/04/2007	12:37:55.100	Interval	11.1241	0.0758
19/04/2007	12:38:55.100	Interval	11.2862	0.0753
19/04/2007	12:39:55.100	Interval	11.6467	0.077
AVERAGE			**11.20504**	**0.0745**
19/04/2007	12:40:55.100	Interval	11.8905	0.0831
19/04/2007	12:41:55.100	Interval	11.5903	0.0928
19/04/2007	12:42:55.100	Interval	11.585	0.1005
19/04/2007	12:43:55.100	Interval	11.6418	0.0275
19/04/2007	12:44:55.100	Interval	11.6756	0.0511
AVERAGE			**11.67664**	**0.071**
19/04/2007	12:45:55.100	Interval	11.7248	0.0386
19/04/2007	12:46:55.100	Interval	11.6689	0.0339
19/04/2007	12:47:55.100	Interval	11.2232	0.0562
19/04/2007	12:48:55.100	Interval	11.4273	0.0716
19/04/2007	12:49:55.100	Interval	11.656	0.0738
AVERAGE			**11.54004**	**0.05482**
19/04/2007	12:50:55.100	Interval	10.4417	0.077
19/04/2007	12:51:55.100	Interval	10.9607	0.079
19/04/2007	12:52:55.100	Interval	13.5787	0.0789
19/04/2007	12:53:55.100	Interval	14.2465	0.0815
19/04/2007	12:54:55.100	Interval	13.9293	0.0838
AVERAGE			**12.63138**	**0.08004**
19/04/2007	12:55:55.100	Interval	13.6069	0.0797
19/04/2007	12:56:55.100	Interval	13.1772	0.0281
19/04/2007	12:57:55.100	Interval	13.0383	0.0526
19/04/2007	12:58:55.100	Interval	13.0651	0.0362
19/04/2007	12:59:55.100	Interval	12.7932	0.0505
AVERAGE			**13.13614**	**0.04942**
19/04/2007	13:00:55.100	Interval	12.481	0.0663
19/04/2007	13:01:55.100	Interval	12.1228	0.07
19/04/2007	13:02:55.100	Interval	12.0012	0.0753
19/04/2007	13:03:55.100	Interval	12.5943	0.0821
19/04/2007	13:04:55.100	Interval	14.2283	0.0899
AVERAGE			**12.68552**	**0.07672**
19/04/2007	13:05:55.100	Interval	11.1962	0.0957
19/04/2007	13:06:55.100	Interval	8.7833	0.1038
19/04/2007	13:07:55.100	Interval	8.291	0.1115
19/04/2007	13:08:55.100	Interval	8.825	0.0954
19/04/2007	13:09:55.100	Interval	9.2705	0.034
AVERAGE			**9.2732**	**0.08808**
19/04/2007	13:10:55.100	Interval	8.9248	0.0643
19/04/2007	13:11:55.100	Interval	13.4688	0.0397
19/04/2007	13:12:55.100	Interval	15.4851	0.0572
19/04/2007	13:13:55.100	Interval	16.2143	0.0615
19/04/2007	13:14:55.100	Interval	15.5879	0.0657

AVERAGE	**13.93618**	**0.05768**
19/04/2007 13:15:55.100 Interval	14.1851	0.07
19/04/2007 13:16:55.100 Interval	13.4933	0.0732
19/04/2007 13:17:55.100 Interval	14.2888	0.0777
19/04/2007 13:18:55.100 Interval	15.4191	0.0831
19/04/2007 13:19:55.100 Interval	13.9151	0.0883
AVERAGE	**14.26028**	**0.07846**
19/04/2007 13:20:55.100 Interval	12.6086	0.0937
19/04/2007 13:21:55.100 Interval	11.9044	0.0715
19/04/2007 13:22:55.100 Interval	11.5189	0.4096
19/04/2007 13:23:55.100 Interval	11.3115	0.0623
19/04/2007 13:24:55.100 Interval	11.9668	0.0475
AVERAGE	**11.86204**	**0.13692**
19/04/2007 13:25:55.100 Interval	12.4222	0.0646
19/04/2007 13:26:55.100 Interval	15.2619	0.0795
19/04/2007 13:27:55.100 Interval	18.2055	0.0886
19/04/2007 13:28:55.100 Interval	18.6778	0.0988
19/04/2007 13:29:55.100 Interval	18.2409	0.1023
AVERAGE	**16.56166**	**0.08676**
19/04/2007 13:30:55.100 Interval	18.5725	0.1046
19/04/2007 13:31:55.100 Interval	17.2525	0.1111
19/04/2007 13:32:55.100 Interval	16.3908	0.1215
19/04/2007 13:33:55.100 Interval	16.1477	0.1361
19/04/2007 13:34:55.100 Interval	15.4906	0.089
AVERAGE	**16.77082**	**0.11246**
19/04/2007 13:35:55.100 Interval	15.3149	0.061
19/04/2007 13:36:55.100 Interval	15.4416	0.0675
19/04/2007 13:37:55.100 Interval	15.6646	0.0474
19/04/2007 13:38:55.100 Interval	15.498	0.0595
19/04/2007 13:39:55.100 Interval	14.5368	0.0823
AVERAGE	**15.29118**	**0.06354**
19/04/2007 13:40:55.100 Interval	14.2441	0.0857
19/04/2007 13:41:55.100 Interval	13.46	0.0884
19/04/2007 13:42:55.100 Interval	12.8627	0.0907
19/04/2007 13:43:55.100 Interval	13.0727	0.0954
19/04/2007 13:44:55.100 Interval	13.0351	0.0993
AVERAGE	**13.33492**	**0.0919**

Loading Rack Back-Pressure Data Sheet

Internal Pressure of Vapor Collection System
at Truck Vapor Collection System Coupling

Site: KINDERMORGAN WILLBRIDGE Operator: POWELL

Date: 4/19/07

Coupling Location	Time	Instant. ▲P	Interval Max ▲P	Notes	Coupling Location	Time	Instant. ▲P	Interval Max ▲P	Notes
~~2~~ 1W	550	13.0	15.0	2 ARMS	2E	800	5.0	12.0	
1W	555	8.0	8.0	1 ARM	2E	805	5.0	5.0	
2W	600	6.0	12.0		1W	810	10.5	11.0	
2W	605	11.0	11.0		1W	815	10.0	10.0	
1W	610	5.0	6.5		1W	820	5.5	5.5	
2E	625	1.0	1.0		2W	825	8.0	8.0	
3E	625	5.0	14.0		1W	830	7.0	8.0	
1E	630	11.0	12.0		3W	835	7.0	10.0	
2W	635	7.0	7.0		3W	840	5.0	6.0	
3W	640	6.0	17.5	1 ARM	1E	845	5.5	12.0	
1W	645	8.0	8.0		1E	850	9.5	9.5	
1W	650	6.0	6.0		2E	900	4.5	12.5	
1E	655	6.0	6.0		2W	905	7.5	7.5	
1W	700	5.0	5.0		1W	915	10.5	10.5	
2E	705	2.0	2.0		2W	920	7.0	7.0	
2E	715	3.0	3.0		2W	930	3.0	7.5	
1E	720	12.0	12.0		2W	935	7.5	7.5	
1W	725	7.0	7.0		1E	940	5.0	5.0	
1E	745	6.0	6.5		2E	950	6.5	6.5	
1W	750	7.0	7.5		2W	955	12.0	12.0	
2W	755	6.0	6.0		2E	1000	1.0	6.0	

Loading Rack Back-Pressure Data Sheet

Internal Pressure of Vapor Collection System
at Truck Vapor Collection System Coupling

Site: KINDERMORGAN WILLBRIDGE Operator: PWEE

Date: 4/19/07

Coupling Location	Time	Instant. ▲P	Interval Max ▲P	Notes	Coupling Location	Time	Instant. ▲P	Interval Max ▲P	Notes
2W	1005	7.5	16.0		2E	105	6.0	6.5	
2W	1010	10.5	10.5		3E	110	8.0	15.5	
1E	1015	5.0	7.0		3E	115	4.0	5.0	
3W	1020	5.5	12.0		1W	120	4.0	10.0	
3W	1025	4.0	5.0		2E	125	6.0	6.0	
3W	1030	4.5	6.0		2E	130	6.0	6.0	
2E	1030	6.0	11.0		1W	135	10.0	12.5	
1E	1035	7.0	7.0						
1E	1100	4.5	5.0						
1E	1105	4.0	4.5						
1E	1120	7.0	8.0						
2E	1125	10.0	10.0						
1W	1145	5.0	5.0						
1W	1150	9.5	9.5						
2W	1155	4.0	4.0						
1W	1230	8.0	11.5						
1W	1235	6.0	6.0						
1W	1245	4.0	6.0						
2E	1250	5.0	5.0						
2E	1255	4.5	10.5						
2E	100	5.0	5.0						

Method 21
Determination of Volatile Organic Compound Leaks

Site: KINDERMORGAN WILLBRIDGE

Date: 4/16/07

Instrument:
Reference Compound:
Response Time::
Date of Calibration:

Leak Analysis of Vapor Collection Hoses

Hose Location	Hose Coupling	Flex Hose Body	Hose/rack coupling	Flapper Valves	Background VOC level
2E	0	0	0	0 0	0
2W	0	0	0	0 0	0
1E	5	0	0	0	0
1W	0	0	0	0	0
3W	50,000+	0	0	0	0
3E	50,000+	0	0	0	0

360ppm REPLACED GASKETS 640ppm

Leak Analysis of Terminal Loading Rack, Vapor Processor , Holder, and Tank Farm Connections

Loading Rack	Flame Arrestor	Flanges	Valves	PV Devices	Background VOC level
LANE 2W	—	0	0	—	0
LANE 1W	—	0	0	—	0
LANE 1E	—	0	0	—	0
LANE 2E	—	0	0	—	0
VAPOR LINE	0	0	0	0	0

DHLGE

KINDER MORGAN

TERMINAL HOURLY FLOW RATE LOG

DATE: 4.19.7 INBOUND or OUTBOUND (circle one)

MARINE (circle one) SHIP or BARGE VESSEL NAME: PROSPECTOR

TERMINAL (circle one) Tk to Tk - TANK CAR - OLYP/L - KMP/L - INCO P/L - CPL batch ID #

PRODUCT REG U/L TOTAL VOLUME 48m TANKS (S) INVOLVED 1

IF PRODUCT IS OUTBOUND WAS PUMP OIL LEVEL CHECKED BEFORE STARTING
(circle one) Yes or NO Operator Initial's

27m TANK NO. 101 START TIME: 0500 FINISH TIME: 1137 SAMPLED TIME & BY

21m TANK NO. 101 START TIME: 1147 FINISH TIME: SAMPLED TIME & BY

TANK NO. START TIME: FINISH TIME: SAMPLED TIME & BY

TIME	TANK		GAUGE	BARRELS	B.P.H.	TOTAL TO GO	ESTIMATED FINISH/SWITCH TIME	OPR. INITIALS
0500	101		34-1 3/8	69343	START	27000		KSR/SA
0600	101		32-1 3/4	65373	3970	23030		KSR/SA
0724	101		29-3	59536	4169	17193	407 1130	SS
Start Test → 0744	101		28.7	58193	4029	15850		SS
0830	101		27-6 1/8	55024	4133	12681		SS
1004	101		23-9 5/8	48602	4099	6259		SS
1147	101		20-8 1/8	42265		21000		SS
1252	101		18-5 3/4	37838	4087	16573	400 1700	SS
FINISH TEST → 1345	101		16-8 1/2	34270	4039	13005		SS

Kinder Morga
Linnton and Willbridge Terminals
Portland Or.

G:kindermorgan/km_wb-ln/Terminal Hourly Flow Rate Log
11/3/200512:16 PM

TERMINAL ID: 0087330 KINDER MORGAN-WILLBRIDGE

PRODUCT	PRODUCT NAME	GROSS	NET
PRODUCT SUMMARY			
UNL87	REG UNL 87	558288517	557057240
SUL92	SUPER UNL 92	038795265	038825717
ETOH	ETHANOL	011764631	021330379
SHADD	HITEC 6531T	016128247	016128247
GEADD	ULTRAZOL 8219CA	063831056	063831056
DSL	ULSD#2 D-15	242421632	215511144
SHRED	ULSD BK50	002497728	002497728
LUBADD	LUBRICITY ADDITIVE	016870272	016870272
PRMDSL	ADDITIVE FOR #2 ULSD D-15	003694598	003694598
AVGAS	AV GAS	032566771	000000000
JETA	AVAITION JET FUEL	021721122	066632472
DTRMX	DISTILATE TRANSMIX	009920258	024629568

FINISH VRU TEST
T-101 16-8 1/2

GROSS TOTAL GALS. OF REG U/L GAS LOADED AT RACK DURING TEST
199,175 GALS

GROSS TOTAL BBLS ON BARGE LOADED DURING TEST
23,922.25 BBL

GROSS TOTAL GALS OF PREM U/L GAS LOADED AT RACK DURING TEST
6609 GALS

BARGE - PROSPECTOR

Rack - 205,784 gal gasoline
Barge 23,922.25 x 42 = 1,004,735 gal gasol

1,210,519 gal total

GROSS TOTAL GALS. OF ETHANOL LOADED AT RACK DURING TEST
Ø GALS.

GROSS TOTAL GALS. OF DIESEL LOADED AT RACK DURING TEST
79,789 GALS

3568

TERMINAL ID: 0087330 KINDER MORGAN-WILLBRIDGE

START
T-101 28-7

PRODUCT SUMMARY

PRODUCT	PRODUCT NAME	GROSS	NET
UNL87	REG UNL 87	558089342	556857413
SUL92	SUPER UNL 92	038788565	038819007
ETOH	ETHANOL	011764631	021330379
SHADD	HITEC 6531T	016128247	016128247
GEADD	ULTRAZOL 8219CA	063817057	063817057
DSL	ULSD#2 D-15	242341843	215453090
SHRED	ULSD BK50	002497728	002497728
LUBADD	LUBRICITY ADDITIVE	016858938	016858938
PRMDSL	ADDITIVE FOR #2 ULSD D-15	003694598	003694598
AVGAS	AV GAS	032566771	000000000
JETA	AVAITION JET FUEL	021700521	066632472
DTRMX	DISTILATE TRANSMIX	009920258	024629568

Oregon
Theodore R. Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6945
TTY (503) 229-5471

April 9, 2007

Kinder Morgan Energy Partners, LLP
Attn: Steve Osborn
PO Box 837
Rocklin CA 95677

Re: AQ Multnomah County
Title V Permit No 26-2028
Source test plan for bulk gasoline terminal's & marine terminal's vapor collection and control system: Revised letter

Dear Mr Osborn:

This letter replaces the one sent you dated April 5, 2007. It removes two numbered items in that letter that applied to a previous test plan, but do not apply to this one.

VOC Testing's source-test plan is acceptable for their work. I am hopeful that the monitoring you plan will be adequate if high pressures develop.

Whether the test is acceptable will probably depend mainly on whether records of plant operations enable determining operating conditions well enough to show the conditions that appear to drive the highest pressures in the delivery tanks and the vapor recovery system.

Condition 26 in Kinder Morgan's Title V permit, issued in 2003, requires Kinder Morgan to test the Willbridge truck terminal once per permit term for compliance with the VOC emission limit in Conditions 24.a.i, 35 mg/L of gasoline loaded, and 24.c.i, a maximum pressure of 18 in H_2O in each delivery tank loaded. The specified test methods include leak testing before the emissions test.

Condition 38 requires Kinder Morgan to test its marine, barge-loading terminal annually for compliance with Condition 37b, 5.7 mg/L gasoline loaded or 95 percent destruction efficiency.

On March 12, 2007, I received your test plan for leak, pressure, and emissions testing of the Willbridge terminal's vapor recovery system for marine and truck loading. Upon request,you also emailed the plan on March 26, 2007. I understand that this plan is essentially the same as we discussed for the full test you planned last fall. You plan to test April 19, 2007.

1. Since Kinder Morgan knows approximate fuel pumping rates, they are to produce, throughout the emissions and pressure test, at least when back pressures may exceed 15 in

H_2O, loading-rate information for each fuel at each end of each lane that will enable estimating the vapor flow rate at the pressure-monitoring location and the combined vapor flow rate in each main-pipe section downstream. This is to correlate loading conditions approximately with pressures to tell which conditions may produce excessive pressures.

a. I understand that these data will be the combined loading rate of each fuel through the recorded number of arms to each end of each lane. This information is to enable estimating the loading rates (and vapor recovery rates) at the lane ends and the total vapor-return rate in each section of the main pipe to the recovery unit. The pressure at a vapor-return hookup may be high because of high vapor flow rate through the pipe from that location, relative to the pipe's cross-sectional area and any bottlenecks, and/or because the combined vapor flow rate downstream from there from more than one loading location is high, relative to the pipes' cross-sectional areas and any bottlenecks.
b. It appears important for Kinder Morgan to record this information whenever a new arm starts dispensing or an arm stops dispensing. Just as the testers must record the highest pressures reached during each five-minute period, Kinder Morgan must have records that show the loading conditions during these high pressures.

2. For barge loading, Kinder Morgan will document hourly readings of loading flow rates and the records of total loading used for billing.
3. Kinder Morgan is to document measures of operating conditions of the vapor recovery unit
   a. Records of the latest checks of the carbon beds' effectiveness
   b. Desorbing times and vacuum levels of each bed
   c. Operation of the booster, e.g., during marine loading.
4. Kinder Morgan is to document the date and actions of the last cleaning or maintenance of the vapor recovery system that may have removed dirt or materials that could increase back pressures.

If you have questions or change the test plan or date, please call me at (503) 229-5579. My fax number is (503) 229-6945. My email address is Herbert.Jack@deq.state.or.us.

Sincerely,

Jack Herbert

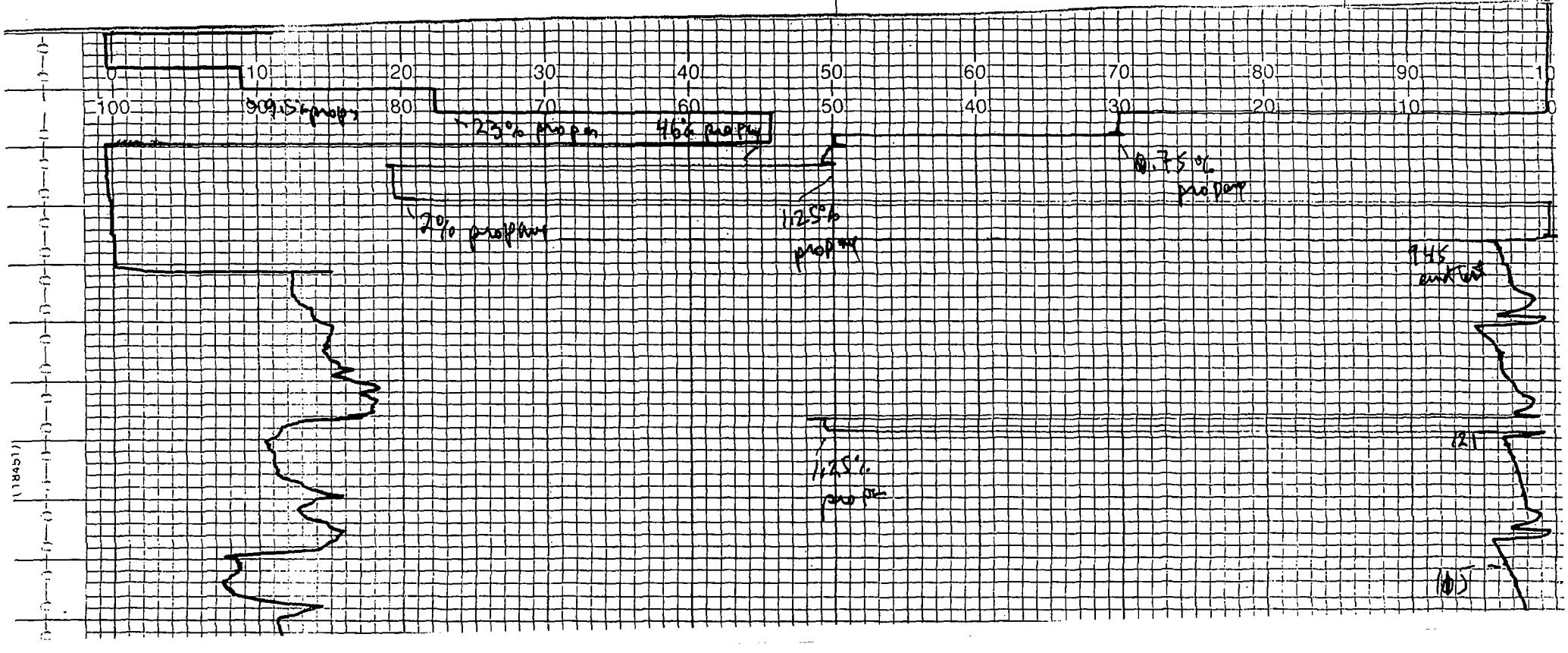
Jack Herbert
Source Test Coordinator

JHH

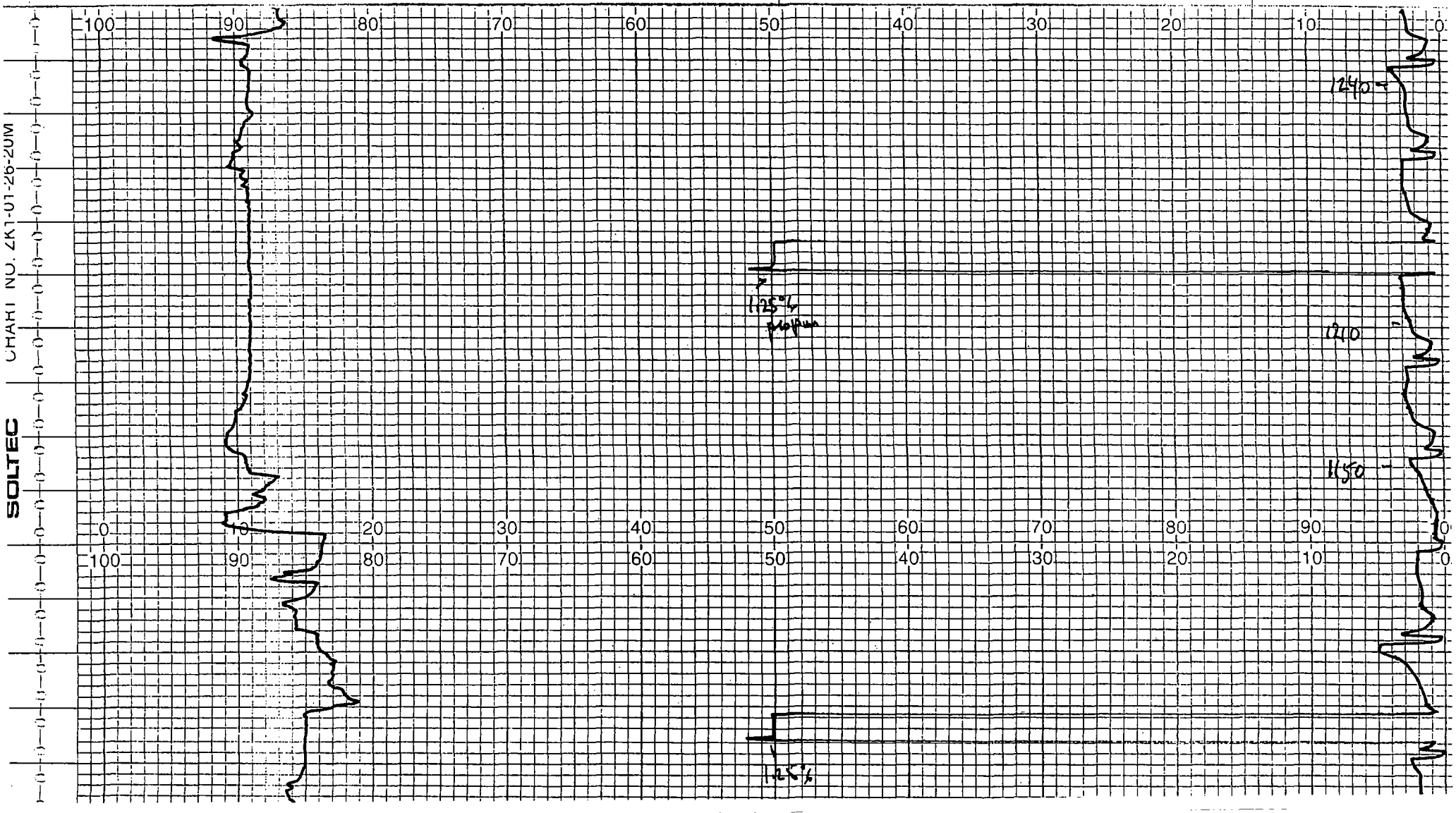
c: George Yun: NWR

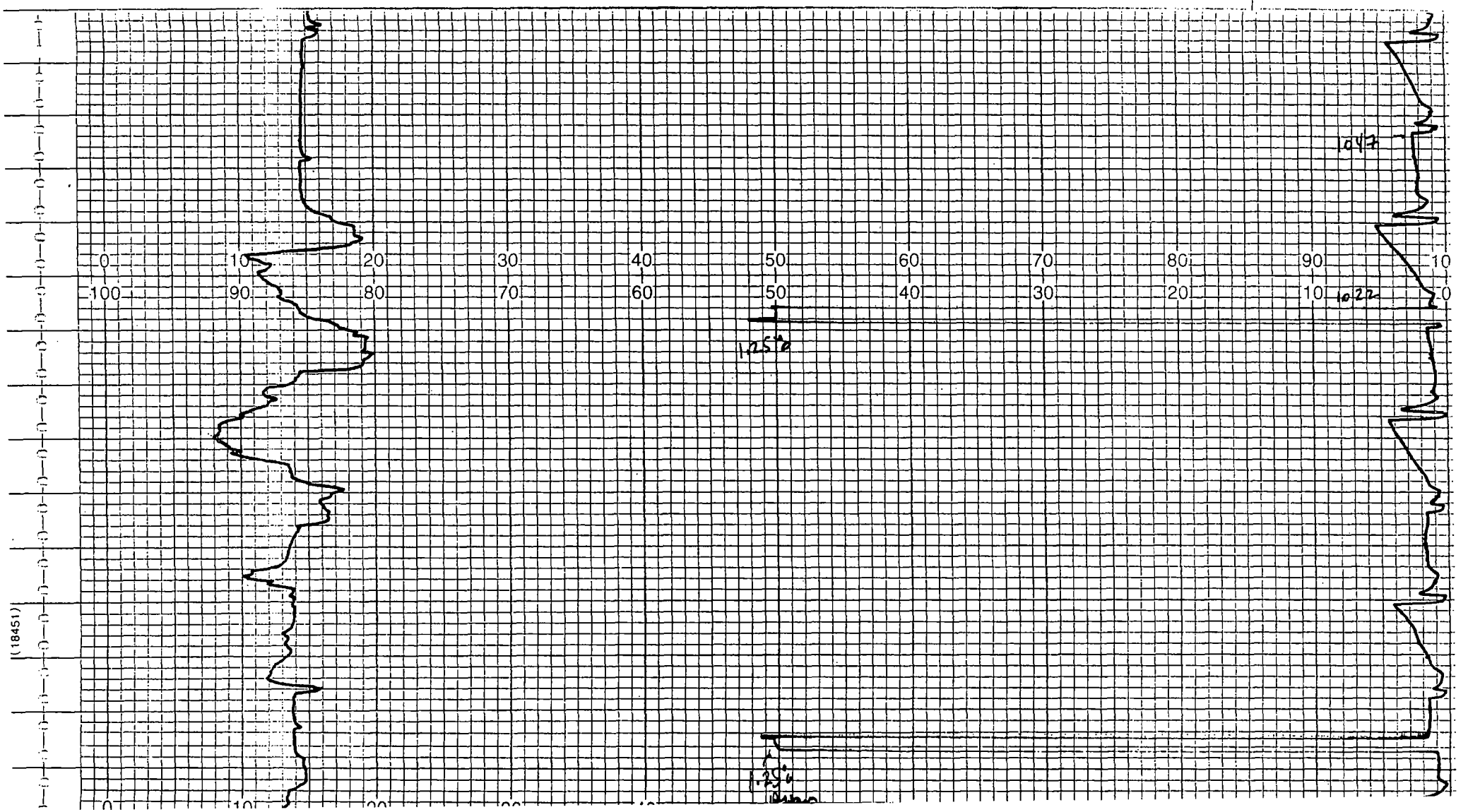
Kinder Morgan Energy Partners, LLP
Attn: Wally Stevenson
11400 NW St Helens Road
Portland, OR 97231

VOC Testing, Inc
Attn: Delbert Powell
PO Box 5892
San Bernardino, California 92412

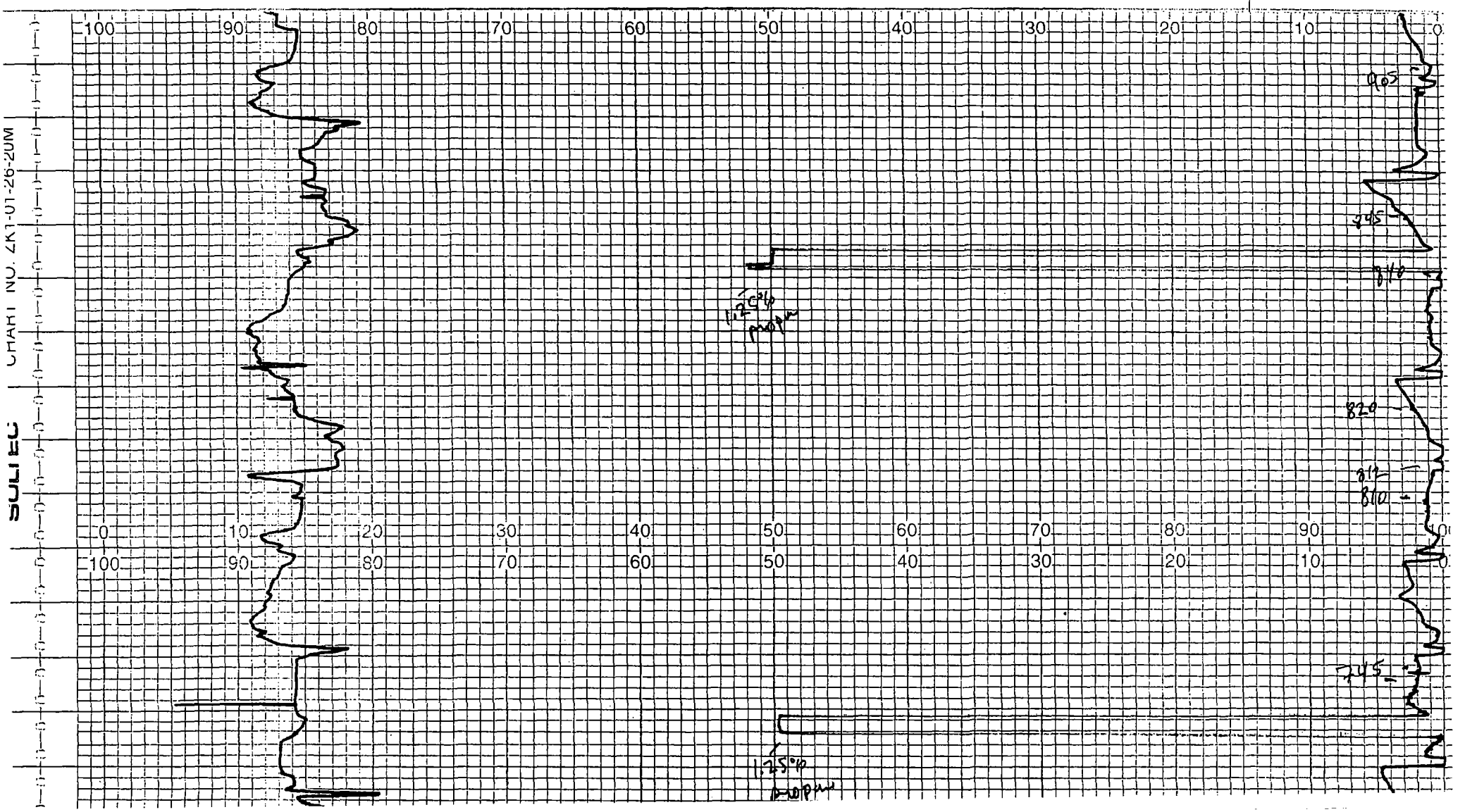


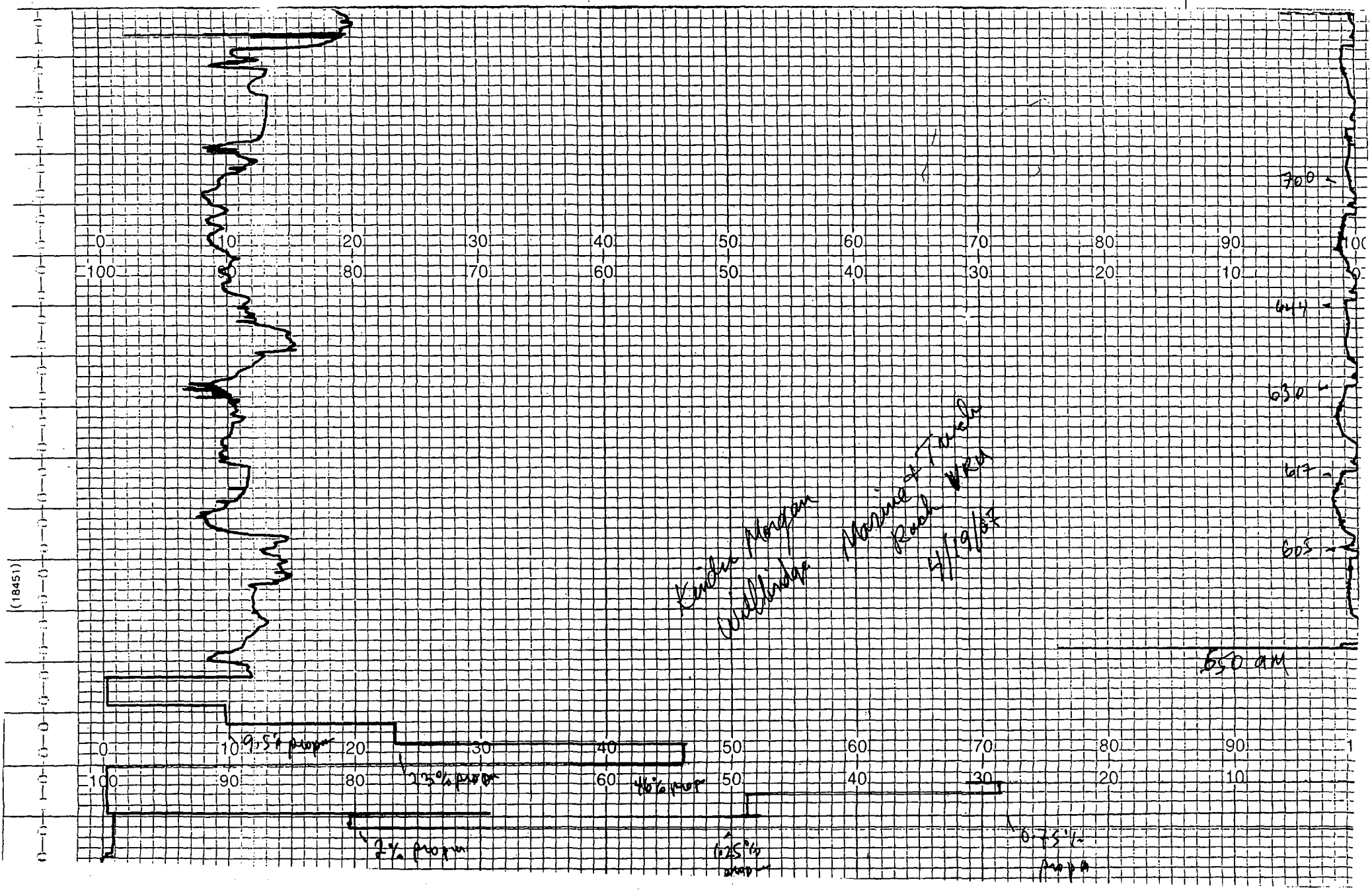
0
10
20
30
40
50
60
70
80
90
100
90
80
70
60
50
40
30
20
10
0
9.5% propy
23% propy
46% propy
2% propy
1.25% propy
0.75% propy
945 end test
1.25% propy
121
105
(18451)


SOLTEC
CHART NO. ZK1-01-26-20M
100
90
80
70
60
50
40
30
20
10
0
1240
1210
1150
1.25% propane
1.25%



0 10 20 30 40 50 60 70 80 90 10
100 90 80 70 60 50 40 30 20 10 0
1047
1022
1.25%
1.25%
(18451)


SOLTEC
CHART NO. ZK1-01-26-20M
100
90
80
70
60
50
40
30
20
10
0
905
845
840
820
812
810
745
1.25% propane
1.25% propane



700
644
630
617
605
650 am
Kinder Morgan
Willbridge
Marine + Truck
Rock WRU
4/19/07
9.5% propa
23% propa
46% propa
2% propa
1.25% propa
0.75% propa
(18451)

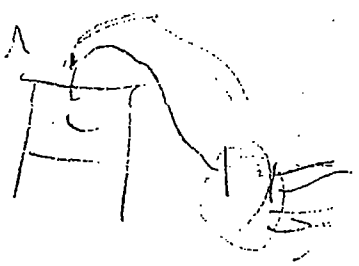
INDIVIDUAL PRODUCTS

EUR 022

Willbridge Source Test
Date: 4-19-07 Recorded by: B HAATAM

Time	Rack Lane	Product Types	# of Arms loading at Truck	# of Arms loading at Trailer	GPM Truck	GPM Trailer	Comments
5:50	1	GAS	2	2	1020	1170	13" / 15"
6:00	1		0	0			
6:10	1	GAS	2	2	580	1080	1080 6.5"
6:15	1		0	0			10
6:20	1		0	0			6.5"
6:25	1		0	0			5.0"
6:30	1	GAS	1	1	600	620	10.5
6:35	1		0	0			
6:40	1		0	0			17.5
6:45	1		0	2		1190	
6:50	1		0	0			
6:55	1	DSL	1		520		11"
7:00	1	GAS		2	600		
7:00	1	DSL	1	0	520		
7:05	1						
7:10	1		0	0			
7:15	1		0	0			
7:20	1	GAS	2	2	580	1210	
7:25	1	GAS	1	0	300	580	
7:30	1						
7:50	1	DSL	1		520		
	1	GAS	1		600		
	1	GAS	1	2		1150	7"
7:55	1		0	0			
8:00	1		0	0			
8:05	1		0	0			
8:10	1		0	0			3"
8:15	1	GAS	2	2	1170	930	~~8"~~ 11"
8:20	1		0	0			
8:25	1		0	0			
8:30	1	GAS	2	1	1050	580	
8:30	1	DSL		1		400	
8:35	1		0	0			
8:40			0	0			
8:45	1	GAS	1	1	600	600	
8:50	1	GAS	1	1	600	600	

Notes:



Willbridge Source Test
Date: 4-19-07 Recorded by: B HAUSAM

Time	Rack Lane	Product Types	# of Arms loading at Truck	# of Arms loading at Trailer	GPM Truck	GPM Trailer	Comments
8:55	1	GAS	0	1		600	4"
9:00	1	GAS	0	1		600	
9:05	1		0	0			
9:10	1	GAS	0	1		617	5.5
9:15	1	GAS	0	1		580	
9:20	1		0	0			
9:40	1	GAS	1	1	250	250	
9:45	1		0	0			
9:50	1	GAS	2	2	750	700	
9:55	1	"	2	2	750	700	
10:00	1	"	0	1		600	
10:05	1		0	0			
10:10	1		0	0			
10:15	1	GAS	2	3	1150	1250	
10:20	1	"	0	1		380	
10:25	1		0	0			
10:30	1		0	0			
10:35	1		0	0			
10:40			0	0			
10:45			0	0			
10:50			0	0			
10:55			0	0			
11:00		DSL	1	1	550	550	
11:05		DSL	1	1	550	550	
11:10			0	0			
11:15			0	0			
11:20			0	0			
11:25			0	0			
11:30			0	0			
11:35			0	0			
11:40	1	DSL	0	~~550~~ 1		550	
11:40	1	GAS	0	1		600	
11:45	1	GAS	0	1		600	
11:50	1	DSL	0	1		550	
11:55			0	0			
12:00			0	0			

Notes:

Willbridge Source Test
Date: 4-19-07 Recorded by: B HAUSAM

Time	Rack Lane	Product Types	# of Arms loading at Truck	# of Arms loading at Trailer	GPM Truck	GPM Trailer	Comments
12:05	1		0	0			
12:10	1		0	0			
12:15	1		0	0			
12:20	1		0	0			
12:25	1		0	0			
12:30	1	DSL	1	2	540	510	
12:30		GAS	1	1	600	600	
12:35		GAS	0	1		600	
12:40			0	0			
12:45		GAS	2	2	1100	600	
12:50		GAS	1	0	600		
12:55		"	1		600		
1:00			0	0			
1:05			0	0			
1:10	1	GAS	2	2	910	875	
1:15		"	1	1	550	265	
1:20		GAS	0	1		600	
1:25		GAS	2	0	1050		
1:30		"	2	2	1050	360	
1:35		"	1	0	400		
1:40			0	0			
1:45			0	0			

Notes:

ENTER 022

Willbridge Source Test
Date: 4/15/07 Recorded by: T Pupp RACK 2

Time	Rack Lane	Product Types	# of Arms loading at Truck	# of Arms loading at Trailer	GPM Truck	GPM Trailer	Comments
0555		DSL GAS	1	3	600		
0600		DSL GAS					N/L
05		DSL GAS	0	2		1200	
10							N/L
15							N/L
20			1				N/L
25		GAS	1	1	600	600	
30							N/L
35		GAS	1		600		
40		GAS	2	1	900	625	
45							N/L
50							N/L
55		GAS	2	1	900	400	
0700		GAS		1		430	
05							N/L
10							N/L
15							N/L
20							N/L

Notes:

(1)

RACK 2

Willbridge Source Test
Date: 4-19-07 Recorded by: T Dupp

Time	Rack Lane	Product Types	# of Arms loading at Truck	# of Arms loading at Trailer	GPM Truck	GPM Trailer	Comments
0755		GAS	2	2	600	600	
0800		GAS	1	2	250	1000	
05							N/L
10							N/L
15		DSL	1	1	500	450	
20		DSL	1	1	500	450	
25							N/L
30							N/L
35		GAS	2		750		
40		GAS		2		1200	
45		GAS		2		1200	
50		GAS		1		180	
55							N/L
0900							N/L
05		DSL GAS	1	2	480	950	
10		DSL	1	1	480	450	
15							N/L
20		DSL/GAS	1	2	Ø	600	
35		DSL	1	3	576	600/66	
40		Diesel	1	0	600		
50		GAS	2	2	800	700	
55		GAS	1		450		
1000							N/L
05		GAS	2	2	950	1000	
10		GAS	2	2	800	1000	
15							N/L
20		DSL	1		600		
25							N/L
30							N/L
35		GAS	1	1	800	600	
40							N/L
45							
50							
55							
1100							

Notes:

(2)

Rack 2

Willbridge Source Test
Date: Recorded by:

Time	Rack Lane	Product Types	# of Arms loading at Truck	# of Arms loading at Trailer	GPM Truck	GPM Trailer	Comments
1105							N/L
10							N/L
15							N/L
20		DSL	1	1	200	600	
25		DSL	1	1	600	400	
30		DSL	1	1	150	600	
35							N/L
40							N/L
45							N/L
50							N/L
55			1	0	588		
1200							N/L
05							N/L
10							N/L
15							N/L
20							N/L
25							N/L
30							N/L
35		GAS	2	1080			
40							N/L
45							N/L
50		GAS	1		550		1
55		GAS	1	1	400		1300 N/L
1305		GAS	2	2	950	1000	
1310		GAS	2		950		
15							N/L
20							N/L
25		GASO	2	2	1100	1200	
30		GAS		1		600	
35							N/L
40							N/L
45							N/L
1350	DONE						

Notes:

Willbridge Source Test

Date: Recorded by:

Time	Rack Lane	Product Types	# of Arms loading at Truck	# of Arms loading at Trailer	GPM Truck	GPM Trailer	Comments
0830	3	Diesel	1	1	450	450	
0835	3	Diesel	1	1	430	450	
0840	3	Diesel	1	1	450	450	
1000	3	Jet	0	1	0	165	
1005	3	Jet	1	1	535	525	
1010	3	Jet	1	1	525	520	
1020	3	Diesel	0	1	~~450~~	165	
1025	3	Diesel	1	1	490	500	
1030	3	Diesel	Ø	1	Ø	550	
1240	3	Diesel	1	Ø	440	Ø	
1245	3	Diesel	1	Ø	475	Ø	
0110	3	Jet	Ø	1	Ø	~~540~~	15:59
0115	3	Jet	1	1	400	~~Ø~~ 168	

Notes:

Willbridge Source Test
Date: Recorded by:

Time	Rack Lane	Product Types	# of Arms loading at Truck	# of Arms loading at Trailer	GPM Truck	GPM Trailer	Comments
[illegible]	3				600		
0630	3	Jet	1	Ø	[illegible]	Ø	
0640	3	Jet	1	1	[illegible]	520	
0645	3	Jet	1	Ø	[illegible]		
0650	3	Jet	1	1	540	520	7"
	3						
	3						
	3						
	3						
	3						

Notes:

Appendix B

Calibration Data

DICK MUNNS COMPANY

Liquid and Gas - Flowmeter Calibration Service
10572 Calle Lee - 138 • Los Alamitos, California 90720
Telephone (714) 827-1215 • Telefax (714) 827-0823

CERTIFICATE OF CALIBRATION

Client Name:	VOC TESTING	Calibration Date:	1-8-2007
Reference Number:		Calibration Due:	1-8-2008
Instrument Manufacturer:	ROCKWELL	Calibration Fluid:	AIR @ 760mmHGA 70F
Instrument Description:	GAS TURBINE	Standard(s) Used:	A359,A4,A312 DUE 4-07
Model Number:	T-60	NIST Traceability Per:	7737/3096,37720
Serial Number:	812591	Ambient Conditions:	763 mmHGA 31%RH 68F
Uncertainty:	+/-1% RD	Procedure Number:	NAVAIR17-20MG
Uncertainty Given:	WITHIN SPECS. AS RECEIVED	Certificate/File Number:	417104.07

INDICATED UUT TOTAL CU.FT.	ACTUAL DM.STD. TOTAL CU.FT.	ACTUAL DM.STD. ACFM	ACTUAL PERCENT ERROR
100	99.61	100	-.39%
200	200.52	150	+.26%
400	401.50	200	+.38%
400	401.50	200	+.38%
1000	1003.10	610	+.31%
2000	2007.28	980	+.36%

STANDAARD	ASSET#	CAL DATE	DUE DATE	NIST#	PROCEDURE
VENTURI	A359	4-06	4-07	737I3096	COMPARISON
BELL PROVER	A4	2-06	2-07	737I37720	COMPARISON
OMEGA TEMP.CALIBRATER	A312	4-06	4-07	55108	COMPARISON

All instruments used in the performance of the above calibration have direct traceability to the National Institute of Standards and Technology (NIST). The accuracy ratio between the calibration standards used and the unit under test is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the above listed procedure number, in accordance with ISO 10012-1, 17025 , ANSI/NCSL-Z-540-1, and/or MIL-STD-45662A.

Calibration Performed By:

P.A. RC
DICK MUNNS COMPANY

Approved By:

R.L.MUNNS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (951) 653-6780 • FAX (951) 653-2430

Report Of Analysis
NIST-Traceable Gas Mixtures

VOCT01
TO: VOC Testing Inc
Attn: Del Powell
PO Box 5892
San Bernardino, CA 92412
(909) 381-4664

REPORT NO: 49965-01
REPORT DATE: May 30, 2006
CUSTOMER PO NO: VBL:D POWELL

CYLINDER NUMBER: **CA05963**

COMPONENT	CONCENTRATION (v/v)	NIST TRACEABLE REFERENCE STANDARD
Propane	0.748 ± 0.007 %	SRM 2648a
Nitrogen	Balance	

Cylinder Size: 150A (106 std cu ft)
Cylinder Pressure: 1500 psig
Shelf Life: 36 months

ppm = umole/mole % = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed herein. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report Number NMAP 232.09/202491.

ANALYST: M.S.Calhoun APPROVED: J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis charged by the company without extra cost

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (951) 653-6780 • FAX (951) 653-2430

Report Of Analysis
NIST-Traceable Gas Mixtures

VOCT01
TO: VOC Testing Inc
Attn: Del Powell
PO Box 5892
San Bernardino, CA 92412
(909) 381-4664

REPORT NO: 49965-02
REPORT DATE: May 30, 2006
CUSTOMER PO NO: VBL:D POWELL

CYLINDER NUMBER: **CA05996**

COMPONENT	CONCENTRATION (v/v)	NIST TRACEABLE REFERENCE STANDARD
Propane	1.263 ± 0.013 %	Gravimetric
Nitrogen	Balance	

Cylinder Size: 150A (71 std cu ft)
Cylinder Pressure: 1000 psig
Shelf Life: 36 months

ppm = umole/mole % = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed herein. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report Number MMAP 232.09/202491.

ANALYST: M.S Calhoun APPROVED: J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (951) 653-6780 • FAX (951) 653-2430

Report Of Analysis
NIST-Traceable Gas Mixtures

VOCT01
TO: VOC Testing Inc
Attn: Del Powell
PO Box 5892
San Bernardino, CA 92412
(909) 381-4664

REPORT NO: 51140-01
REPORT DATE: January 12, 2007
CUSTOMER PO NO: VBL: D POWELL

CYLINDER NUMBER: CA01502

COMPONENT	CONCENTRATION (v/v)	NIST TRACEABLE REFERENCE STANDARD
Propane	2.006 ± 0.020 %	Gravimetric
Nitrogen	Balance	

Cylinder Size: 150A (78 std cu ft)
Cylinder Pressure: 1100 psig
Shelf Life: 36 months

ppm = umole/mole % = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed herein. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report Number MMAP 232.09/202491.

ANALYST: M.S.Calhoun APPROVED: J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (951) 653-6780 • FAX (951) 653-2430

Report Of Analysis
NIST-Traceable Gas Mixtures

VOCT01
TO: VOC Testing Inc
Attn: Del Powell
PO Box 5892
San Bernardino, CA 92412
(909) 381-4664

REPORT NO: 50513-01
REPORT DATE: September 15, 2006
CUSTOMER PO NO: VBL: D POWELL

CYLINDER NUMBER: **0686080A**

COMPONENT	CONCENTRATION (v/v)	NIST TRACEABLE REFERENCE STANDARD
Propane	46.2 ± 0.5 %	Volumetric
Nitrogen	Balance	

Cylinder Size: 66SLP (0 std cu ft)
Cylinder Pressure: 130 psig
Shelf Life: 36 months

ppm = umole/mole % = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed herein. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report Number MMAP 232.09/202491.

ANALYST: M.S.Calhoun APPROVED: J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (951) 653-6780 • FAX (951) 653-2430

REPORT OF ANALYSIS

VOCT01

DATE: 5/3/05

TO: Del Powell
VOC Testing Inc
PO Box 5892
San Bernardino CA 92412

CUSTOMER ORDER NUMBER: Vbl/D Powell

CYLINDER NUMBER : 606302A

COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
Propane	23.05 ± 0.23%	Gravimetric
Nitrogen	Balance	

Shelf life = 3 years
ppm = µmole/mole % = mole-%
Cylinder Pressure: 240 psig

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standards listed above.
Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance NIST Weight Report No. MMAP 232109/202491.

ANALYST _____ M.S. Calhoun

APPROVED _____ J.T. Marrin

SCOTT-MARRIN, INC.
6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (951) 653-6780 • FAX (951) 653-2430

Report of Analysis
NIST-Traceable Gas Mixtures

VOCT01

TO: VOC Testing Inc
Attn: Del Powell
PO Box 5892
San Bernardino, CA 92412
(909) 381-4664

REPORT NO: 49539-03
REPORT DATE: March 16, 2006
CUSTOMER PO NO: Vbl/D Powell

CYLINDER NUMBER: CA05814

COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
Propane	9.49 ± 0.10%	Gravimetric
Nitrogen	Balance	

Cylinder Size:	150A
Cylinder Pressure:	670 psig
Shelf Life:	36 months

ppm = μmole/mole % = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standard listed herein. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report Number MMAP 232.09/202491.

ANALYST B.R. More APPROVED D.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

Appendix C

Test Methods

§60.495 Reporting and recordkeeping requirements.

(a) The owner or operator of an affected facility shall include the following data in the initial compliance report required under §60.8(a).

(1) Where only coatings which individually have a VOC content equal to or less than the limits specified under §60.492 are used, and no VOC is added to the coating during the application or distribution process, the owner or operator shall provide a list of the coatings used for each affected facility and the VOC content of each coating calculated from data determined using Reference Method 24 or supplies by the manufacturers of the coatings.

(2) Where one or more coatings which individually have a VOC content greater than the limits specified under §60.492 are used or where VOC are added or used in the coating process, the owner or operator shall report for each affected facility the volume-weighted average of the total mass of VOC per volume of coating solids.

(3) Where compliance is achieved through the use of incineration, the owner or operator shall include in the initial performance test required under §60.8(a) the combustion temperature (or the gas temperature upstream and downstream of the catalyst bed), the total mass of VOC per volume of coating solids before and after the incinerator, capture efficiency, and the destruction efficiency of the incinerator used to attain compliance with the applicable emission limit specified under §60.492. The owner or operator shall also include a description of the method used to establish the amount of VOC captured by the capture system and sent to the control device.

(b) Following the initial performance test, each owner or operator shall identify, record, and submit quarterly reports to the Administrator of each instance in which the volume-weighted average of the total mass of VOC per volume of coating solids, after the control device, if capture devices and control systems are used, is greater than the limit specified under §60.492. If no such instances occur during a particular quarter, a report stating this shall be submitted to the Administrator semiannually.

(c) Following the initial performance test, the owner or operator of an affected facility shall identify, record, and submit at the frequency specified in §60.7(c) the following:

(1) Where compliance with §60.492 is achieved through the use of thermal incineration, each 3-hour period when cans are processed, during which the average temperature of the device was more than 28°C below the average temperature of the device during the most recent performance test at which destruction efficiency was determined as specified under §60.493.

(2) Where compliance with §60.492 is achieved through the use of catalytic incineration, each 3-hour period when cans are being processed, during which the average temperature of the device immediately before the catalyst bed is more than 28°C below the average temperature of the device immediately before the catalyst bed during the most recent performance test at which destruction efficiency was determined as specified under §60.493 and all 3-hour periods, when cans are being processed, during which the average temperature difference across the catalyst bed is less than 80 percent of the average temperature difference across the catalyst bed during the most recent performance test at which destruction efficiency was determined as specified under §60.494.

(3) For thermal and catalytic incinerators, if no such periods as described in paragraphs (c)(1) and (c)(2) of this section occur, the owner or operator shall state this in the report.

(d) Each owner or operator subject to the provisions of this subpart shall maintain at the source, for a period of at least 2 years, records of all data and calculations used to determine VOC emissions from each affected facility in the initial and monthly performance tests. Where compliance is achieved through the use of thermal incineration, each owner or operator shall maintain, at the source, daily records of the incinerator combustion chamber temperature. If catalytic incineration is used, the owner or operator shall maintain at the source daily records of the gas temperature, both upstream and downstream of the incinerator catalyst bed. Where compliance is achieved through the use of a solvent recovery system, the owner or operator shall maintain at the source daily records of the amount of solvent recovered by the system for each affected facility.

(e) The requirements of this section remain in force until and unless EPA, in delegating enforcement authority to a State under section 111(c) of the Act, approves reporting requirements or an alternative means of compliance surveillance adopted by such State. In that event, affected facilities within the State will be relieved of the obligation to comply with this subsection, provided that they comply with the requirements established by the State.

[47 FR 49612, Nov. 1, 1982, as amended at 55 FR 51384, Dec. 13, 1990]

§60.496 Test methods and procedures.

(a) The reference methods in appendix A to this part, except as provided in §60.8, shall be used to conduct performance tests.

(1) Reference Method 24, an equivalent or alternative method approved by the Administrator, or manufacturers formulation for data from which the VOC content of the coatings used for each affected facility can be calculated. In the event of dispute, Reference Method 24 shall be the referee method. When VOC content of waterborne coatings, determined from data generated by Reference Method 24, is used to determine compliance of affected facilities, the results of the Method 24 analysis shall be adjusted as described in section 4.4 of Method 24.

(2) Reference Method 25 or an equivalent or alternative method for the determination of the VOC concentration in the effluent gas entering and leaving the control device for each stack equipped with an emission control device. The owner or operator shall notify the Administrator 30 days in advance of any State test using Reference Method 25. The following reference methods are to be used in conjunction with Reference Method 25:

(i) Method 1 for sample and velocity traverses,

(ii) Method 2 for velocity and volumetric flow rate,

(iii) Method 3 for gas analysis, and

(iv) Method 4 for stack gas moisture.

(b) For Reference Method 24, the coating sample must be a 1-litre sample collected in a 1-litre container at a point where the sample will be representative of the coating material.

(c) For Reference Method 25, the sampling time for each of three runs must be at least 1 hour. The minimum sample volume must be 0.003 dscm except that shorter sampling times or smaller volumes, when necessitated by process variables or other factors, may be approved by the Administrator. The Administrator will approve the sampling of representative stacks on a case-by-case basis if the owner or operator can demonstrate to the satisfaction of the Administrator that the testing of representative stacks would yield results comparable to those that would be obtained by testing all stacks.

Subpart XX—Standards of Performance for Bulk Gasoline Terminals

SOURCE: 48 FR 37590, Aug. 18, 1983, unless otherwise noted.

§60.500 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is the total of all the loading racks at a bulk gasoline terminal which deliver liquid product into gasoline tank trucks.

(b) Each facility under paragraph (a) of this section, the construction or modification of which is commenced after December 17, 1980, is subject to the provisions of this subpart.

(c) For purposes of this subpart, any replacement of components of an existing facility, described in paragraph (a) of this section, commenced before August 18, 1983 in order to comply with any emission standard adopted by a State or political subdivision thereof will not be considered a reconstruction under the provisions of 40 CFR 60.15.

NOTE: The intent of these standards is to minimize the emissions of VOC through the application of best demonstrated technologies (BDT). The numerical emission limits in this standard are expressed in terms of total organic compounds. This emission limit reflects the performance of BDT.

30.501 Definitions.

The terms used in this subpart are ›fined in the Clean Air Act, in §60.2 of ıis part, or in this section as follows:

Bulk gasoline terminal means any gas-ine facility which receives gasoline ; pipeline, ship or barge, and has a ısoline throughput greater than 75,700 ters per day. Gasoline throughput ıall be the maximum calculated de-.gn throughput as may be limited by ɔmpliance with an enforceable condi-lon under Federal, State or local law nd discoverable by the Administrator nd any other person.

Continuous vapor processing system ıeans a vapor processing system that reats total organic compounds vapors ollected from gasoline tank trucks on demand basis without intermediate ccumulation in a vapor holder.

Existing vapor processing system means vapor processing system [capable of chieving emissions to the atmosphere ıo greater than 80 milligrams of total ›rganic compounds per liter of gasoline oaded], the construction or refurbish-nent of which was commenced before December 17, 1980, and which was not :onstructed or refurbished after that late.

Gasoline means any petroleum dis-:illate or petroleum distillate/alcohol ›lend having a Reid vapor pressure of 27.6 kilopascals or greater which is ısed as a fuel for internal combustion engines.

Gasoline tank truck means a delivery tank truck used at bulk gasoline ter-minals which is loading gasoline or which has loaded gasoline on the im-mediately previous load.

Intermittent vapor processing system means a vapor processing system that employs an intermediate vapor holder to accumulate total organic com-pounds vapors collected from gasoline tank trucks, and treats the accumu-lated vapors only during automatically controlled cycles.

Loading rack means the loading arms, pumps, meters, shutoff valves, relief valves, and other piping and valves necessary to fill delivery tank trucks.

Refurbishment means, with reference to a vapor processing system, replace-ment of components of, or addition of components to, the system within any 2-year period such that the fixed cap-ital cost of the new components re-quired for such component replacement or addition exceeds 50 percent of the cost of a comparable entirely new sys-tem.

Total organic compounds means those compounds measured according to the procedures in §60.50.

Vapor collection system means any equipment used for containing total or-ganic compounds vapors displaced dur-ing the loading of gasoline tank trucks.

Vapor processing system means all equipment used for recovering or oxi-dizing total organic compounds vapors displaced from the affected facility.

Vapor-tight gasoline tank truck means a gasoline tank truck which has dem-onstrated within the 12 preceding months that its product delivery tank will sustain a pressure change of not more than 750 pascals (75 mm of water) within 5 minutes after it is pressurized to 4,500 pascals (450 mm of water). This capability is to be demonstrated using the pressure test procedure specified in Reference Method 27.

§60.502 Standard for Volatile Organic Compound (VOC) emissions from bulk gasoline terminals.

On and after the date on which §60.8(a) requires a performance test to be completed, the owner or operator of each bulk gasoline terminal containing an affected facility shall comply with the requirements of this section.

(a) Each affected facility shall be equipped with a vapor collection sys-tem designed to collect the total or-ganic compounds vapors displaced from tank trucks during product loading.

(b) The emissions to the atmosphere from the vapor collection system due to the loading of liquid product into gasoline tank trucks are not to exceed 35 milligrams of total organic com-pounds per liter of gasoline loaded, ex-cept as noted in paragraph (c) of this section.

(c) For each affected facility equipped with an existing vapor proc-essing system, the emissions to the at-mosphere from the vapor collection system due to the loading of liquid product into gasoline tank trucks are not to exceed 80 milligrams of total or-ganic compounds per liter of gasoline loaded.

(d) Each vapor collection system shall be designed to prevent any total organic compounds vapors collected at one loading rack from passing to an-other loading rack.

(e) Loadings of liquid product into gasoline tank trucks shall be limited to vapor-tight gasoline tank trucks using the following procedures:

(1) The owner or operator shall ob-tain the vapor tightness documenta-tion described in §60.505(b) for each gasoline tank truck which is to be loaded at the affected facility.

(2) The owner or operator shall re-quire the tank identification number to be recorded as each gasoline tank truck is loaded at the affected facility.

(3) The owner or operator shall cross-check each tank identification number obtained in paragraph (e)(2) of this sec-tion with the file of tank vapor tight-ness documentation within 2 weeks after the corresponding tank is loaded.

(4) The terminal owner or operator shall notify the owner or operator of each nonvapor-tight gasoline tank truck loaded at the affected facility within 3 weeks after the loading has occurred.

(5) The terminal owner or operator shall take steps assuring that the nonvapor-tight gasoline tank truck will not be reloaded at the affected fa-cility until vapor tightness documenta-tion for that tank is obtained.

(6) Alternate procedures to those de-scribed in paragraphs (e)(1) through (5) of this section for limiting gasoline tank truck loadings may be used upon application to, and approval by, the Administrator.

(f) The owner or operator shall act to assure that loadings of gasoline tank trucks at the affected facility are made only into tanks equipped with vapor collection equipment that is compat-ible with the terminal's vapor collec-tion system.

(g) The owner or operator shall act to assure that the terminal's and the tank truck's vapor collection systems are connected during each loading of a gas-oline tank truck at the affected facil-ity. Examples of actions to accomplish this include training drivers in the hookup procedures and posting visible reminder signs at the affected loading racks.

(h) The vapor collection and liquid loading equipment shall be designed and operated to prevent gauge pressure in the delivery tank from exceeding 4,500 pascals (450 mm of water) during product loading. This level is not to be exceeded when measured by the proce-dures specified in §60.503(d).

(i) No pressure-vacuum vent in the bulk gasoline terminal's vapor collec-tion system shall begin to open at a system pressure less than 4,500 pascals (450 mm of water).

(j) Each calendar month, the vapor collection system, the vapor processing system, and each loading rack handling gasoline shall be inspected during the loading of gasoline tank trucks for total organic compounds liquid or vapor leaks. For purposes of this para-graph, detection methods incorporat-ing sight, sound, or smell are accept-able. Each detection of a leak shall be recorded and the source of the leak re-paired within 15 calendar days after it is detected.

[48 FR 37590, Aug. 19, 1983; 48 FR 56580, Dec. 22, 1983, as amended at 54 FR 6678, Feb. 14, 1989]

§60.503 Test methods and procedures.

(a) In conducting the performance tests required in §60.8, the owner or op-erator shall use as reference methods and procedures the test methods in ap-pendix A of this part or other methods and procedures as specified in this sec-tion, except as provided in §60.8(b). The three-run requirement of §60.8(f) does not apply to this subpart.

(b) Immediately before the perform-ance test required to determine com-pliance with §60.502 (b), (c), and (h), the owner or operator shall use Method 21 to monitor for leakage of vapor all po-tential sources in the terminal's vapor collection system equipment while a gasoline tank truck is being loaded. The owner or operator shall repair all leaks with readings of 10,000 ppm (as methane) or greater before conducting the performance test.

(c) The owner or operator shall deter-mine compliance with the standards in §60.502 (b) and (c) as follows:

(1) The performance test shall be 6 hours long during which at least 300,000 liters of gasoline is loaded. If this is not possible, the test may be continued

the same day until 300,000 liters of gasoline is loaded or the test may be resumed the next day with another complete 6-hour period. In the latter case, the 300,000-liter criterion need not be met. However, as much as possible, testing should be conducted during the 6-hour period in which the highest throughput normally occurs.

(2) If the vapor processing system is intermittent in operation, the performance test shall begin at a reference vapor holder level and shall end at the same reference point. The test shall include at least two startups and shutdowns of the vapor processor. If this does not occur under automatically controlled operations, the system shall be manually controlled.

(3) The emission rate (E) of total organic compounds shall be computed using the following equation:

$$E = K \sum_{i=1}^{n} \frac{(V_{sai}\, C_{ti})}{(L\ 10^6)}$$

where:

E=emission rate of total organic compounds, mg/liter of gasoline loaded.

V_{sai}=volume of air-vapor mixture exhausted at each interval "i", scm.

C_{ti}=concentration of total organic compounds at each interval "i", ppm.

L=total volume of gasoline loaded, liters.

n=number of testing intervals.

i=emission testing interval of 5 minutes.

K=density of calibration gas, 1.83×10^6 for propane and 2.41×10^6 for butane, mg/scm.

(4) The performance test shall be conducted in intervals of 5 minutes. For each interval "i", readings from each measurement shall be recorded, and the volume exhausted (V_{sai}) and the corresponding average total organic compounds concentration (C_{ti}) shall be determined. The sampling system response time shall be considered in determining the average total organic compounds concentration corresponding to the volume exhausted.

(5) The following methods shall be used to determine the volume (V_{sai}) air-vapor mixture exhausted at each interval:

(i) Method 2B shall be used for combustion vapor processing systems.

(ii) Method 2A shall be used for all other vapor processing systems.

(6) Method 25A or 25B shall be used for determining the total organic compounds concentration (C_{ti}) at each interval. The calibration gas shall be either propane or butane. The owner or operator may exclude the methane and ethane content in the exhaust vent by any method (e.g., Method 18) approved by the Administrator.

(7) To determine the volume (L) of gasoline dispensed during the performance test period at all loading racks whose vapor emissions are controlled by the processing system being tested, terminal records or readings from gasoline dispensing meters at each loading rack shall be used.

(d) The owner or operator shall determine compliance with the standard in §60.502(h) as follows:

(1) A pressure measurement device (liquid manometer, magnehelic gauge, or equivalent instrument), capable of measuring up to 500 mm of water gauge pressure with ±2.5 mm of water precision, shall be calibrated and installed on the terminal's vapor collection system at a pressure tap located as close as possible to the connection with the gasoline tank truck.

(2) During the performance test, the pressure shall be recorded every 5 minutes while a gasoline truck is being loaded; the highest instantaneous pressure that occurs during each loading shall also be recorded. Every loading position must be tested at least once during the performance test.

[54 FR 6678, Feb. 14, 1989; 54 FR 21344, Feb. 14, 1989]

§60.504 [Reserved]

§60.505 Reporting and recordkeeping.

(a) The tank truck vapor tightness documentation required under §60.502(e)(1) shall be kept on file at the terminal in a permanent form available for inspection.

(b) The documentation file for each gasoline tank truck shall be updated at least once per year to reflect current test results as determined by Method 27. This documentation shall include, as a minimum, the following information:

(1) Test title: Gasoline Delivery Tank Pressure Test—EPA Reference Method 27.

(2) Tank owner and address.

(3) Tank identification number.

(4) Testing location.

(5) Date of test.

(6) Tester name and signature.

(7) Witnessing inspector, if any: Name, signature, and affiliation.

(8) Test results: Actual pressure change in 5 minutes, mm of water (average for 2 runs).

(c) A record of each monthly leak inspection required under §60.502(j) shall be kept on file at the terminal for at least 2 years. Inspection records shall include, as a minimum, the following information:

(1) Date of inspection.

(2) Findings (may indicate no leaks discovered; or location, nature, and severity of each leak).

(3) Leak determination method.

(4) Corrective action (date each leak repaired; reasons for any repair interval in excess of 15 days).

(5) Inspector name and signature.

(d) The terminal owner or operator shall keep documentation of all notifications required under §60.502(e)(4) on file at the terminal for at least 2 years.

(e) [Reserved]

(f) The owner or operator of an affected facility shall keep records of all replacements or additions of components performed on an existing vapor processing system for at least 3 years.

[48 FR 37590, Aug. 18, 1983; 48 FR 56580, Dec. 22, 1983]

§60.506 Reconstruction.

For purposes of this subpart:

(a) The cost of the following frequently replaced components of the affected facility shall not be considered in calculating either the "fixed capital cost of the new components" or the "fixed capital costs that would be required to construct a comparable entirely new facility" under §60.15: pump seals, loading arm gaskets and swivels, coupler gaskets, overfill sensor couplers and cables, flexible vapor hoses, and grounding cables and connectors.

(b) Under §60.15, the "fixed capital cost of the new components" includes the fixed capital cost of all depreciable components (except components specified in §60.506(a)) which are or will be replaced pursuant to all continuous programs of component replacement which are commenced within any 2-year period following December 17, 1980. For purposes of this paragraph, "commenced" means that an owner or operator has undertaken a continuous program of component replacement or that an owner or operator has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of component replacement.

Subpart AAA—Standards of Performance for New Residential Wood Heaters

SOURCE: 53 FR 5573, Feb. 26, 1988, unless otherwise noted.

§60.530 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each wood heater manufactured on or after July 1, 1988, or sold at retail on or after July 1, 1990. The provisions of this subpart do not apply to wood heaters constructed prior to July 1, 1988, that are or have been owned by a noncommercial owner for his personal use.

(b) Each affected facility shall comply with the applicable emission limits in §60.532 unless exempted under paragraph (c), (d), (e), (f), (g) or (h) of this section.

(c)(1) Within a model line, an affected facility manufactured prior to July 1, 1990 is exempt from the emission limits in §60.532 if that model line has been issued a valid certificate of compliance by the Oregon Department of Environmental Quality prior to January 1, 1988, and meets the Oregon 1988 standards for particulate matter emissions, provided that

(i) The manufacturer requests the exemption in writing from the Administrator and certifies that the information used in obtaining Oregon certification satisfied applicable requirements of the Oregon law;

(ii) The certification test included at least one test run at a burn rate of less than 1.25 kg/hr;

(iii) No changes in components that may affect emissions have been made to the model line that would require recertification under §60.533(k);

(iv) The manufacturer complies with application requirements contained in

METHOD 2A—DIRECT MEASUREMENT OF GAS VOLUME THROUGH PIPES AND SMALL DUCTS

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of gas flow rates in pipes and small ducts, either in-line or at exhaust positions, within the temperature range of 0 to 60°C.

1.2 Principle. A gas volume meter is used to measure gas volume directly. Temperature and pressure measurements are made to correct the volume to standard conditions.

2. *Apparatus*

Specifications for the apparatus are given below. Any other apparatus that has been demonstrated (subject to approval of the Administrator) to be capable of meeting the specifications will be considered acceptable.

2.1 Gas Volume Meter. A positive displacement meter, turbine meter, or other direct volume measuring device capable of measuring volume to within 2 percent. The meter shall be equipped with a temperature gauge (±2 percent of the minimum absolute temperature) and a pressure gauge (±2.5 mm Hg). The manufacturer's recommended capacity of the meter shall be sufficient for the expected maximum and minimum flow rates at the sampling conditions. Temperature, pressure, corrosive characteristics, and pipe size are factors necessary to consider in choosing a suitable gas meter.

2.2 Barometer. A mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg. In many cases, the barometric reading may be obtained from a nearby National Weather Service station, in which case the station value (which is the absolute barometric pressure) shall be requested, and an adjustment for elevation differences between the weather station and the sampling point shall be applied at a rate of minus 2.5 mm Hg per 30-meter elevation increase, or vice-versa for elevation decrease.

2.3 Stopwatch. Capable of measurement to within 1 second.

3. *Procedure*

3.1 Installation. As there are numerous types of pipes and small ducts that may be subject to volume measurement, it would be difficult to describe all possible installation schemes. In general, flange fittings should be used for all connections wherever possible. Gaskets or other seal materials should be used to assure leak-tight connections. The volume meter should be located so as to avoid severe vibrations and other factors that may affect the meter calibration.

3.2 Leak Test. A volume meter installed at a location under positive pressure may be leak-checked at the meter connections by using a liquid leak detector solution containing a surfactant. Apply a small amount of the solution to the connections. If a leak exists, bubbles will form, and the leak must be corrected.

A volume meter installed at a location under negative pressure is very difficult to test for leaks without blocking flow at the inlet of the line and watching for meter movement. If this procedure is not possible, visually check all connections and assure tight seals.

3.3 Volume Measurement.

3.3.1 For sources with continuous, steady emission flow rates, record the initial meter volume reading, meter temperature(s), meter pressure, and start the stopwatch. Throughout the test period, record the meter temperature(s) and pressure so that average values can be determined. At the end of the test, stop the timer and record the elapsed time, the final volume reading, meter temperature(s), and pressure. Record the barometric pressure at the beginning and end of the test run. Record the data on a table similar to Figure 2A-1.

Plant _____

Date _____ Run Number _____

Sample Location _____

Barometric Pressure mm Hg Start _____ Finish _____

Operators _____

Meter Number _____ Meter Calibration Coefficient _____

Last Date Calibrated _____

Time Run/clock	Volume Meter reading	Static pressure mm Hg	Temperature °C	Temperature °K
Average				

Figure 2A-1. Volume flow rate measurement data.

3.3.2 For sources with noncontinuous, non-steady emission flow rates, use the procedure in 3.3.1 with the addition of the following: Record all the meter parameters and the start and stop times corresponding to each process cyclical or noncontinuous event.

4. *Calibration*

4.1 Volume Meter. The volume meter is calibrated against a standard reference meter prior to its initial use in the field. The reference meter is a spirometer or liquid displacement meter with a capacity consistent with that of the test meter.

Alternatively, a calibrated, standard pitot may be used as the reference meter in conjunction with a wind tunnel assembly. Attach the test meter to the wind tunnel so that the total flow passes through the test meter. For each calibration run, conduct a 4-point traverse along one stack diameter at a position at least eight diameters of straight tunnel downstream and two diameters upstream of any bend, inlet, or air mover. Determine the traverse point locations as specified in Method 1. Calculate the reference volume using the velocity values following the procedure in Method 2, the wind tunnel cross-sectional area, and the run time.

Set up the test meter in a configuration similar to that used in the field installation (i.e., in relation to the flow moving device). Connect the temperature and pressure gauges as they are to be used in the field. Connect the reference meter at the inlet of the flow line, if appropriate for the meter, and begin gas flow through the system to condition the meters. During this conditioning operation, check the system for leaks.

The calibration shall be run over at least three different flow rates. The calibration flow rates shall be about 0.3, 0.6, and 0.9 times the test meter's rated maximum flow rate.

For each calibration run, the data to be collected include: reference meter initial and final volume readings, the test meter initial and final volume reading, meter average temperature and pressure, barometric pressure, and run time. Repeat the runs at each flow rate at least three times.

Calculate the test meter calibration coefficient, Y_m for each run as follows:

$$Y_m = \frac{(V_r - V_o)(t_m + 273)}{(V_m - V_m)(t_r + 273)} \quad \frac{P_r}{(P_m + P_g)}$$

Eq. 2A-1

Where:

Y_m=Test volume meter calibration coefficient, dimensionless.

V_r=Reference meter volume reading, m^3.

V_m=Test meter volume reading, m^3.

t_r=Reference meter average temperature, °C.

t_m=Test meter average temperature, °C.

P_b=Barometric pressure, mm Hg.

P_g=Test meter average static pressure, mm Hg.

f=Final reading for run.

i=Initial reading for run.

Compare the three Y_m values at each of the flow rates tested and determine the maximum and minimum values. The difference between the maximum and minimum values at each flow rate should be no greater than 0.030. Extra runs may be required to complete this requirement. If this specification cannot be met in six successive runs, the test meter is not suitable for use. In addition, the meter coefficients should be between 0.95 and 1.05. If these specifications are met at all the flow rates, average all the Y_m values from runs meeting the specifications to obtain an average meter calibration coefficient, Y_m.

The procedure above shall be performed at least once for each volume meter. Thereafter, an abbreviated calibration check shall be completed following each field test. The calibration of the volume meter shall be checked by performing three calibration runs at a single, intermediate flow rate (based on the previous field test) with the meter pressure set at the average value encountered in the field test. Calculate the average value of the calibration factor. If the calibration has changed by more than 5 percent, recalibrate the meter over the full range of flow as described above.

NOTE.—If the volume meter calibration coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the greater value of pollutant emission rate.

4.2 Temperature Gauge. After each test series, check the temperature gauge at ambient temperature. Use an American Society for Testing and Materials (ASTM) mercury-in-glass reference thermometer, or equivalent, as a reference. If the gauge being checked agrees within 2 percent (absolute temperature) of the reference, the temperature data collected in the field shall be considered valid. Otherwise, the test data shall be considered invalid or adjustments of the test results shall be made, subject to the approval of the Administrator.

4.3 Barometer. Calibrate the barometer used against a mercury barometer prior to the field test.

5. *Calculations*

Carry out the calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation.

5.1 Nomenclature.

P_b=Barometric pressure, mm Hg.

P_g=Average static pressure in volume meter, mm Hg.

Q=Gas flow rate, m^3/min, standard conditions.

T_m=Average absolute meter temperature, °K.

V_m=Meter volume reading, m^3.

Y_m=Average meter calibration coefficient, dimensionless.

f=Final reading for test period.

i=Initial reading for test period.

s=Standard conditions, 20° C and 760 mm Hg.

θ=Elapsed test period time, min.

5.2 Volume.

$$V_{ms} = 0.3853\ Y_m (V_{mf} - V_{mi}) \frac{(P_b + P_g)}{T_m}$$

Eq. 2A-2

5.3 Gas Flow Rate.

$$Q_s = \frac{V_{ms}}{\theta}$$

Eq. 2A-3

6. *Bibliography*

1. Rom, Jerome J. Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. APTD-0576. March 1972.

2. Wortman, Martin, R. Vollaro, and P.R. Westlin. Dry Gas Volume Meter Calibrations. Source Evaluation Society Newsletter. Vol. 2, No. 2. May 1977.

3. Westlin, P.R. and R.T. Shigehara. Procedure for Calibrating and Using Dry Gas Volume Meters as Calibration Standards. Source Evaluation Society Newsletter. Vol. 3, No. 1. February 1978.

METHOD 2B—DETERMINATION OF EXHAUST GAS VOLUME FLOW RATE FROM GASOLINE VAPOR INCINERATORS

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of exhaust volume flow rate from incinerators that process gasoline vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). It is assumed that the amount of auxiliary fuel is negligible.

1.2 Principle. The incinerator exhaust flow rate is determined by carbon balance. Organic carbon concentration and volume flow rate are measured at the incinerator inlet. Organic carbon, carbon dioxide (CO_2), and carbon monoxide (CO) concentrations are measured at the outlet. Then the ratio of total carbon at the incinerator inlet and outlet is multiplied by the inlet volume to determine the exhaust volume and volume flow rate.

2. *Apparatus*

2.1 Volume Meter. Equipment described in Method 2A.

2.2 Organic Analyzers (2). Equipment described in Method 25A or 25B.

2.3 CO Analyzer. Equipment described in Method 10.

2.4 CO_2 Analyzer. A nondispersive infrared (NDIR) CO_2 analyzer and supporting equipment with comparable specifications as CO analyzer described in Method 10.

3. *Procedure*

3.1 Inlet Installation. Install a volume meter in the vapor line to incinerator inlet according to the procedure in Method 2A. At the volume meter inlet, install a sample probe as described in Method 25A. Connect to the probe a leak-tight, heated (if necessary to prevent condensation) sample line (stainless steel or equivalent) and an organic analyzer system as described in Method 25A or 25B.

3.2 Exhaust Installation. Three sample analyzers are required for the incinerator exhaust: CO_2, CO, and organic analyzers. A sample manifold with a single sample probe may be used. Install a sample probe as described in Method 25A. Connect a leak-tight heated sample line to the sample probe. Heat the sample line sufficiently to prevent any condensation.

3.3 Recording Requirements. The output of each analyzer must be permanently recorded on an analog strip chart, digital recorder, or other recording device. The chart speed or number of readings per time unit must be similar for all analyzers so that data can be correlated. The minimum data recording requirement for each analyzer is one measurement value per minute.

3.4 Preparation. Prepare and calibrate all equipment and analyzers according to the procedures in the respective methods. For the CO_2 analyzer, follow the procedures described in Method 10 for CO analysis substituting CO_2 calibration gas where the method calls for CO calibration gas. The span value for the CO_2 analyzer shall be 15 percent by volume. All calibration gases must be introduced at the connection between the probe and the sample line. If a manifold system is used for the exhaust analyzers, all the analyzers and sample pumps must be operating when the calibrations are done. Note: For the purposes of this test, methane should not be used as an organic calibration gas.

3.5 Sampling. At the beginning of the test period, record the initial parameters for the inlet volume meter according to the procedures in Method 2A and mark all of the recorder strip charts to indicate the start of the test. Continue recording inlet organic and exhaust CO_2, CO, and organic concentra-

gas throughout the test. During periods of process interruption and halting of gas flow, stop the timer and mark the recorder strip charts to that data from this interruption are not included in the calculations. At the end of the test period, record the final parameters for the inlet volume meter and mark the end on all of the recorder strip charts.

3.6 Post Test Calibrations. At the conclusion of the sampling period, introduce the calibration gases as specified in the respective reference methods. If an analyzer output does not meet the specifications of the method, invalidate the test data for the period. Alternatively, calculate the volume results using initial calibration data and using final calibration data and report both resulting volumes. Then, for emissions calculations, use the volume measurement resulting in the greatest emission rate or concentration.

4. Calculations

Carry out the calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation.

4.1 Nomenclature.

CO_c=Mean carbon monoxide concentration in system exhaust, ppm.

CO_2=Mean carbon dioxide concentration in system exhaust, ppm.

HC_c=Mean organic concentration in system exhaust as defined by the calibration gas, ppm.

HC_i=Mean organic concentration in system inlet as defined by the calibration gas, ppm.

K=Calibration gas factor

=2 for ethane calibration gas.

=3 for propane calibration gas.

=4 for butane calibration gas.

=Appropriate response factor for other calibration gas.

V_e=Exhaust gas volume, m^3.

V_i=Inlet gas volume, m^3.

Q_e=Exhaust gas volume flow rate, m^3/min.

Q_i=Inlet gas volume flow rate, m^3/min.

θ=Sample run time, min.

s=Standard conditions: 20°C, 760 mm Hg.

300=Estimated concentration of ambient CO_2, ppm. (CO_2 concentration in the ambient air may be measured during the test period using an NDIR).

4.2 Concentrations. Determine mean concentrations of inlet organics, outlet CO_2, outlet CO, and outlet organics according to the procedures in the respective methods and the analyzers' calibration curves, and for the time intervals specified in the applicable regulations. Concentrations should be determined on a parts per million by volume

4.3 Exhaust Gas Volume. Calculate the exhaust gas volume as follows:

$$V_e = V_i \frac{K(HC_i)}{K(HC_c)+CO_2+CO_c-300}$$

Eq. 2B-1

4.4 Exhaust Gas Volume Flow Rate. Calculate the exhaust gas volume flow rate as follows:

$$Q_e = V_e/\theta$$

Eq. 2B-2

5. Bibliography

1. Measurement of Volatile Organic Compounds. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711. Publication No. EPA-450/2-78-041. October 1978. 55 p.

METHOD 2C—DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE (SMALL STACKS OR DUCTS) (STANDARD PITOT TUBE)

1. Applicability and Principle

1.1 Applicability.

1.1.1 The applicability of this method is identical to Method 2, except this method is limited to stationary source stacks or ducts less than about 0.30 meter (12 in.) in diameter or 0.071 m^2 (113 $in.^2$) in cross-sectional area, but equal to or greater than about 0.10 meter (4 in.) in diameter or 0.0081 m^2 (12.57 $in.^2$) in cross-sectional area.

1.1.2 The apparatus, procedure, calibration, calculations, and bibliography are the same as in Method 2, Sections 2, 3, 4, 5, and 6, except as noted in the following sections.

1.2 Principle. The average gas velocity in a stack or duct is determined from the gas density and from measurement of velocity heads with a standard pitot tube.

2. Apparatus

2.1 Standard Pitot Tube (Instead of Type S). Use a standard pitot tube that meets the specifications of Section 2.7 of Method 2. Use a coefficient value of 0.99 unless it is calibrated against another standard pitot tube with an NBS-traceable coefficient.

2.2 Alternative Pitot Tube. A modified hemispherical-nosed pitot tube (see Figure 2C-1), which features a shortened stem and enlarged impact and static pressure holes, may be used. This pitot tube is useful in liquid drop-laden gas streams when a pitot "back purge" is ineffective. Use a coefficient value of 0.99 unless the pitot is calibrated as mentioned in Section 2.1 above.

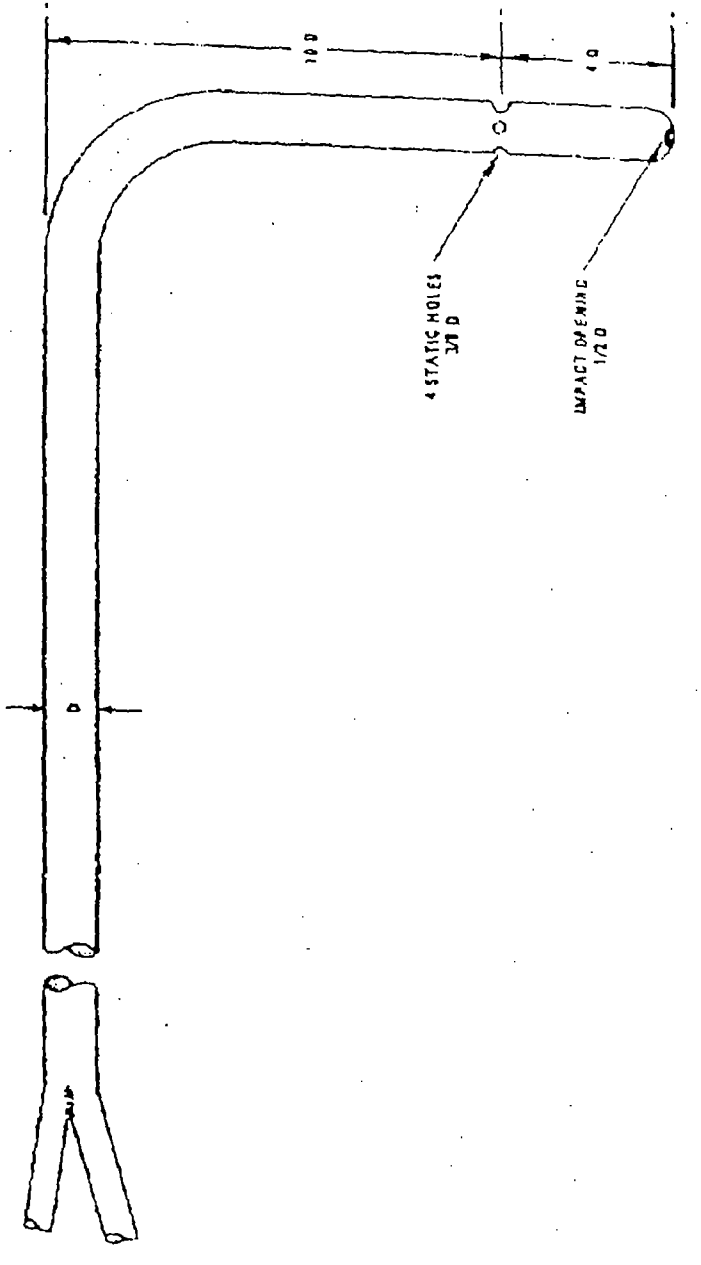


Figure 2C-1. Modified hemispherical-nosed pitot tube.

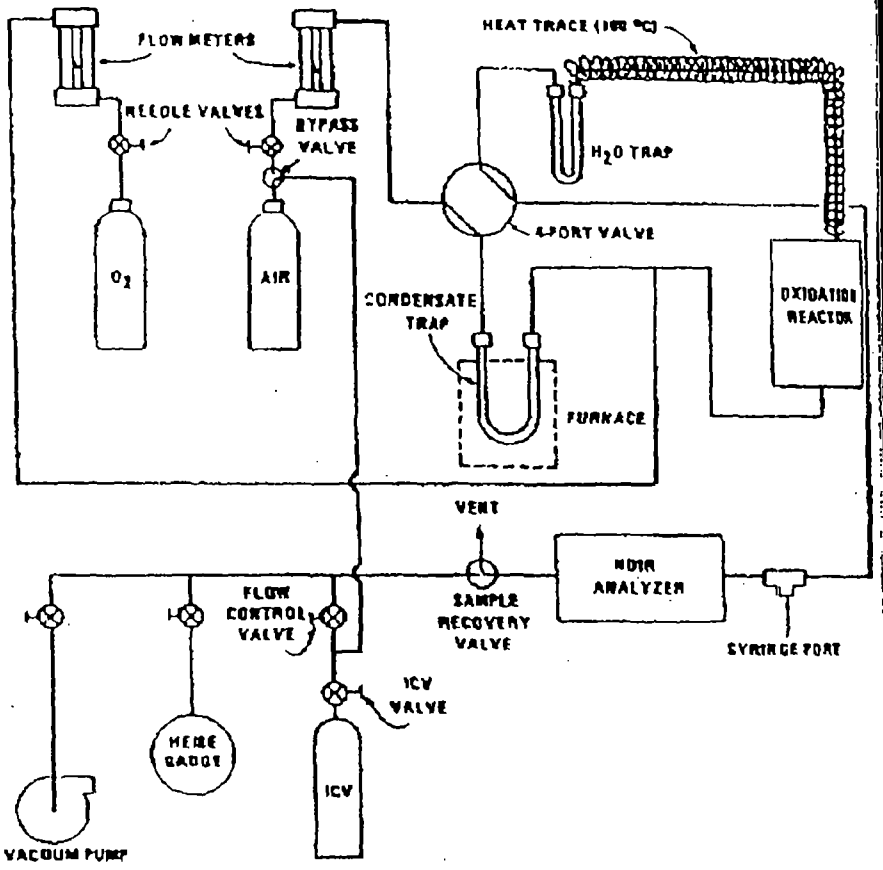


Figure 25-10. Condensate recovery system, collection of trap organics.

METHOD 25A—DETERMINATION OF TOTAL GASEOUS ORGANIC CONCENTRATION USING A FLAME IONIZATION ANALYZER

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. *Definitions*

2.1 Measurement System. The total equipment required for the determination of the gas concentration. The system consists of the following major subsystems:

2.1.1 Sample Interface. That portion of the system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer from the effects of the stack effluent.

2.1.2 Organic Analyzer. That portion of the system that senses organic concentration and generates an output proportional to the gas concentration.

2.2 Span Value. The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the expected concentration. For convenience, the span value should correspond to 100 percent of the recorder scale.

2.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

2.4 Zero Drift. The difference in the measurement system response to a zero level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.5 Calibration Drift. The difference in the measurement system response to a mid-level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.6 Response Time. The time interval from a step change in pollutant concentration at the inlet to the emission measurement system to the time at which 95 percent of the corresponding final value is reached as displayed on the recorder.

2.7 Calibration Error. The difference between the gas concentration indicated by the measurement system and the known concentration of the calibration gas.

3. *Apparatus*

A schematic of an acceptable measurement system is shown in Figure 25A-1. The essential components of the measurement system are described below:

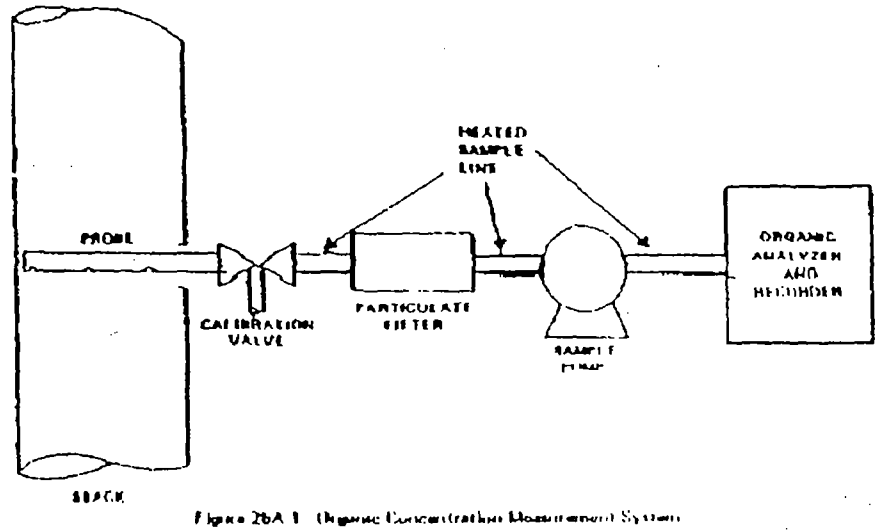


Figure 25A-1. Organic Concentration Measurement System.

3.1 Organic Concentration Analyzer. A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications in this method.

3.2 Sample Probe. Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section.

3.3 Sample Line. Stainless steel or Teflon* tubing to transport the sample gas to the analyzer. The sample line should be heated, if necessary, to prevent condensation in the line.

3.4 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as quick-connect lines, to route calibration gas to the analyzers are applicable.

3.5 Particulate Filter. An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

3.6 Recorder. A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute. Note: This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

4. *Calibration and Other Gases*

Gases used for calibrations, fuel, and combustion air (if required) are contained in compressed gas cylinders. Preparation of calibration gases shall be done according to the procedure in Protocol No. 1, listed in Citation 2 of Bibliography. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ±2 percent from the certified value. For calibration gas values not generally available (i.e., organics between 1 and 10 percent by volume), alternative methods for preparing calibration gas mixtures, such as dilution systems, may be used with prior approval of the Administrator.

Calibration gases usually consist of propane in air or nitrogen and are determined in terms of the span value. Organic compounds other than propane can be used following the above guidelines and making the appropriate corrections for response factor.

---

*Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

4.1 Fuel. A 40 percent H_2/60 percent He or 40 percent H_2/60 percent N_2 gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

4.2 Zero Gas. High purity air with less than 0.1 parts per million by volume (ppmv) of organic material (propane or carbon equivalent) or less than 0.1 percent of the span value, whichever is greater.

4.3 Low-level Calibration Gas. An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

4.4 Mid-level Calibration Gas. An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

4.5 High-level Calibration Gas. An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

5. *Measurement System Performance Specifications*

5.1 Zero Drift. Less than ±3 percent of the span value.

5.2 Calibration Drift. Less than ±3 percent of span value.

5.3 Calibration Error. Less than ±5 percent of the calibration gas value.

6. *Pretest Preparations*

6.1 Selection of Sampling Site. The location of the sampling site is generally specified by the applicable regulation or purpose of the test; i.e., exhaust stack, inlet line, etc. The sample port shall be located at least 1.5 meters or 2 equivalent diameters upstream of the gas discharge to the atmosphere.

6.2 Location of Sample Probe. Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

FIA equipment can be calibrated for almost any range of total organics concentrations. For high concentrations of organics (>1.0 percent by volume as propane) modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

6.4 Calibration Error Test. Immediately prior to the test series, (within 2 hours of the start of the test) introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low- and mid-level gases based on a linear response line between the zero and high-level responses. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer response for low-level and mid-level calibration gases and determine the differences between the measurement system responses and the predicted responses. These differences must be less than 5 percent of the respective calibration gas value. If not, the measurement system is not acceptable and must be replaced or repaired prior to testing. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 7.3). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

6.5 Response Time Test. Introduce zero gas into the measurement system at the calibration valve assembly. When the system output has stabilized, switch quickly to the high-level calibration gas. Record the time from the concentration change to the measurement system response equivalent to 95 percent of the step change. Repeat the test three times and average the results.

7. *Emission Measurement Test Procedure*

7.1 Organic Measurement. Begin sampling at the start of the test period, recording time and any required process information as appropriate. In particular, note on the recording chart periods of process interruption or cyclic operation.

7.2 Drift Determination. Immediately following the completion of the test period and hourly during the test period, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after both the zero and calibration drift checks are made.) Record the analyzer response. If the drift values exceed the specified limits, invalidate the test results preceding the check and repeat the test following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 6.4 and report the results using both sets of calibration data (i.e., data determined prior to the test period and data determined following the test period).

8. *Organic Concentration Calculations*

Determine the average organic concentration in terms of ppmv as propane or other calibration gas. The average shall be determined by the integration of the output recording over the period specified in the applicable regulation.

If results are required in terms of ppmv as carbon, adjust measured concentrations using Equation 25A-1.

$$C_c = K\,C_{meas} \qquad \text{Eq. 25A-1}$$

Where:

C_c=Organic concentration as carbon, ppmv.

C_{meas}=Organic concentration as measured, ppmv.

K=Carbon equivalent correction factor.

K=2 for ethane.

K=3 for propane.

K=4 for butane.

K=Appropriate response factor for other organic calibration gases.

9. *Bibliography*

1. Measurement of Volatile Organic Compounds—Guideline Series. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA-450/2-78-041. June 1978. p. 45-64.

2. Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors (Protocol No. 1). U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Research Triangle Park, NC. June 1978.

3. Gasoline Vapor Emission Laboratory Evaluation—Part 2. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. EMB Report No. 75-GAS-6. August 1975.

METHOD 25B—DETERMINATION OF TOTAL GASEOUS ORGANIC CONCENTRATION USING A NONDISPERSIVE INFRARED ANALYZER

1. *Applicability and Principle*

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes. (Other organic materials may be measured using the general procedure in this method, the appropriate calibration gas, and an analyzer set to the appropriate absorption band.) The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a nondispersive infrared analyzer (NDIR). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. *Definitions*

The terms and definitions are the same as for Method 25A.

3. *Apparatus*

The apparatus is the same as for Method 25A with the exception of the following:

3.1 Organic Concentration Analyzer. A nondispersive infrared analyzer designed to

measure alkane organics and capable of meeting or exceeding the specifications in this method.

4. *Calibration Gases*

The calibration gases are the same as required for Method 25A, Section 4. No fuel gas is required for an NDIR.

6. *Measurement System Performance Specifications*

6.1 Zero Drift. Less than ±3 percent of the span value.

6.2 Calibration Drift. Less than ±3 percent of the span value.

6.3 Calibration Error. Less than ±5 percent of the calibration gas value.

6. *Pretest Preparations*

6.1 Selection of Sampling Site. Same as in Method 25A, Section 6.1.

6.2 Location of Sample Probe. Same as in Method 25A, Section 6.2.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

6.4 Calibration Error Test. Same as in Method 25A, Section 6.4.

6.5 Response Time Test Procedure. Same as in Method 25A, Section 6.5.

7. *Emission Measurement Test Procedure*

Proceed with the emission measurement immediately upon satisfactory completion of the calibration.

7.1 Organic Measurement. Same as in Method 25A, Section 7.1.

7.2 Drift Determination. Same as in Method 25A, Section 7.2.

8. *Organic Concentration Calculations*

The calculations are the same as in Method 25A, Section 8.

9. *Bibliography*

The bibliography is the same as in Method 25A.

Method 25C—[Reserved]

Method 25D—Determination of the Volatile Organic Concentration of Waste Samples

Introduction

Performance of this method should not be attempted by persons unfamiliar with the operation of a flame ionization detector (FID) or an electrolytic conductivity detector (ELCD) because knowledge beyond the scope of this presentation is required.

1. Applicability and Principle

1.1 Applicability. This method is applicable for determining the volatile organic (VO) concentration of a waste sample.

1.2 Principle. A sample of waste is obtained at a point which is most representative of the unexposed waste (where the waste has had minimum opportunity to volatilize to the atmosphere). The sample is suspended in an organic/aqueous matrix, then heated and purged with nitrogen for 30 min in order to separate certain organic compounds. Part of the sample is analyzed for carbon concentration, as methane, with an FID, and part of the sample is analyzed for chlorine concentration, as chloride, with an ELCD. The VO concentration is the sum of the carbon and chlorine content of the sample.

2. Apparatus

2.1 Sampling. The following equipment is required:

2.1.1 Sampling Tube. Flexible Teflon, 0.25 in. ID.

NOTE: Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

2.1.2 Sample Container. Borosilicate glass, 40 mL, and a Teflon lined screw cap capable of forming an air tight seal.

2.1.3 Cooling Coil. Fabricated from 0.25 in. ID 304 stainless steel tubing with a thermocouple at the coil outlet.

2.2 Analysis. The following equipment is required:

2.2.1 Purging Apparatus. For separating the VO from the waste sample. A schematic of the system is shown in Figure 25D-1. The purging apparatus consists of the following major components.

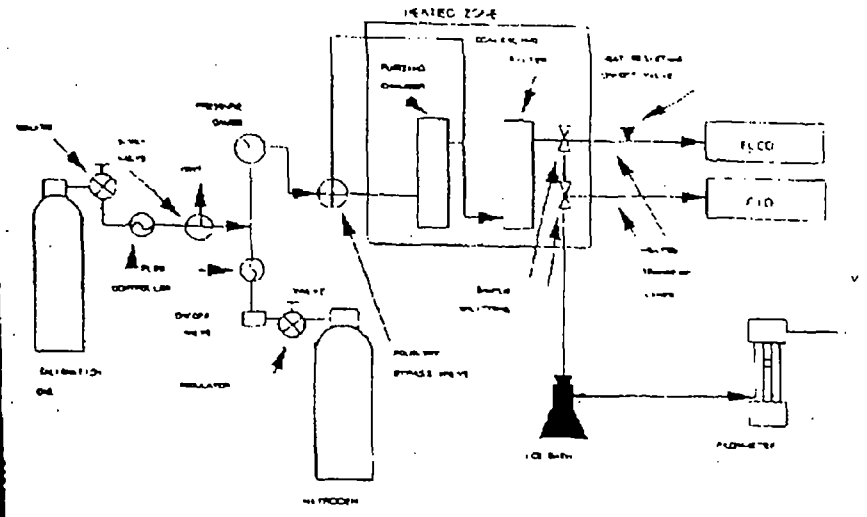


Figure 25D-1. Schematic of Purging Apparatus.

2.2.1.1 Purging Flask. A glass container to hold the sample while it is heated and purged with dry nitrogen. The cap of the purging flask is equipped with three fittings: one for a purging lance (fitting with the #7 Ace-thread), one for the Teflon exit tubing (side fitting, also a #7 Ace-thread), and a third (a 19-mm Ace-thread) to attach the base of the purging flask as shown in Figure 25D-2. The base of the purging flask is a 50-mm ID cylindrical glass tube. One end of the tube is op while the other end is sealed. Exact dim sions are shown in Figure 25D-2.

2.2.1.2 Purging Lance. Glass tube, 6-m OD by 30 cm long. The purging end of t tube is fitted with a four-arm bubbler w each tip drawn to an opening 1 mm in diar ter.

Details and exact dimensions a shown in Figure 25D-2.

VOC Testing Inc.

ENVIRONMENTAL TESTING
AND EVALUATION

P.O. Box 5892 • San Bernardino, CA 92412 • (909) 381-4664 - FAX (909) 381-4967