Pinetree Power, Inc.
1241 Whitefield Road • Bethlehem, New Hampshire 03574 • (603) 444-9993 Fax (603) 444-6476

State of Connecticut
Department of Public Utility Control
Ten Franklin Square
New Britain, CT 06051

July 14, 2008

REF: CT00231-07

Dear Commissioners:

Attached you will find our quarterly affidavit and supporting documentation that the average emission rate of Pinetree Power, Inc. is equal to or less than .075 pounds of nitrogen oxides per million BTU of heat input for class I certificates.

Should you have any questions or require additional information please contact me at (603) 444-9993 x 12

Sincerely,

Mark Driscoll
Plant Manager
Pinetree Power, Inc.

AFFIDAVIT OF MARK DRISCOLL

Mark Driscoll, being duly sworn, deposes and says:

(1) I am the plant manager and duly authorized representative of Pinetree Power, Inc. for the purpose of certifying Class I RPS certificates in Connecticut.

(2) Attached to this affidavit are accurate copies of emissions data for Pinetree Power, Inc. facility for the months of April, May & June 2008.

(3) The attached emissions data demonstrate that the Pinetree Power, Inc. average NOx emission rate during the second quarter of 2008 was equal to or less than the 0.075 lbs/mmBTU threshold level required for Class I certificates.

(4) Further, the affiant sayeth naught.

Date: July 14, 2008

Mark Driscoll

State of New Hampshire
County of Grafton, SS

Personally appeared the person signing the above affidavit and swore that it is true to the best of his knowledge and belief.

Date: 7/14/08

Notary Public

JANICE L. COLE
MY COMMISSION EXPIRES FEB. 8, 2011
NOTARY PUBLIC NEW HAMPSHIRE

GSI Emission Chart 2008 **BETHLEHEM** **MSS 337** **CT00218-07**

2008	Operation Hours	Generation Gross MWh	Generation Net MWh	CO Tons	CO lbs.	CO lb/MWh	NOX Tons	NOX lbs.	NOX lb/MWh	NOX lb/MMbtu	SOX lb/MWh	SOX Tons	SOX lbs.	Particulate lb/MWh	Particulate Tons	Particulate lbs.	Mercury lb/MWh
January	744	12337.78	11367	44.82	89640	7.886	20.07	40140	3.531	0.187	0.0104	0.0640	127.95	0.0452	0.2790	558.00	0.000066
February	668.17	11047.9	10181	44.01	88020	8.646	17.31	34620	3.400	0.180	0.0104	0.0575	114.91	0.0454	0.2506	501.13	0.000066
March	478	7708	7126	37.01	74020	10.387	10.39	20780	2.916	0.100	0.0107	0.0411	82.21	0.0465	0.1793	358.50	0.000068
April	714.25	12123.92	10948	45.09	90180	8.237	7.2	14400	1.315	0.072	0.0101	0.0614	122.84	0.0442	0.2678	535.69	0.000066
May	740.07	11344.37	10272	30.35	60700	5.909	6.083	12166	1.184	0.066	0.0112	0.0636	127.28	0.0489	0.2775	555.05	0.000073
June	698.44	10800.93	9757	25.25	50500	5.176	6.498	12996	1.332	0.068	0.0111	0.0601	120.12	0.0485	0.2619	523.83	0.000073
July					0	#DIV/0!		0	#DIV/0!		#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
August					0	#DIV/0!		0	#DIV/0!		#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
September					0	#DIV/0!		0	#DIV/0!		#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
October					0	#DIV/0!		0	#DIV/0!		#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
November					0	#DIV/0!		0	#DIV/0!		#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
December					0	#DIV/0!		0	#DIV/0!		#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
Total	4042.93	65362.9	59651	226.53	453060		67.551	135102		0.11		0.3477	695.3031		1.5161	3032.1975	

PINETF BETHLEHEM MONTHLY DATA SUMMARY

A_ .8

DATE	CO PPM	CO LB/HR	CO LB/MMBTU	NOx PPM	NOx LB/HR	NOx LB/MMBTU	STEAM K#/HR	STACK KSCFM	O2	OPACITY	NH3 LB/HR	UREA GAL/HR	RATIO NH3/Nox	CATALYST BED TEMP
FULL SCALE	1000	325	1	500	270	0.75	180	75000	21	100				
4/1/2008	1000	461.907	1.554	54.52	22.522	0.076	155.48	57537.03	3.466	1.51				
4/2/2008	695.78	236.232	0.797	55.09	23.779	0.081	155.51	60206.15	4.053	1.58				
4/3/2008	507.14	136.58	0.478	58.69	25.371	0.088	156.06	60280.24	4.209	1.03				
4/4/2008	415.8	109.301	0.374	55.34	23.988	0.082	157.93	60061.19	4.243	1.33				
4/5/2008	413.09	108.552	0.364	50.62	21.883	0.073	159.2	60046.06	4.006	1.28				
4/6/2008	485.21	136.493	0.721	40.04	16.848	0.085	111.13	50587.56	8.664	1.55				
4/7/2008	399.76	104.701	0.362	46.74	20.185	0.07	157.89	59941.74	4.336	0.69				
4/8/2008	381.15	99.325	0.346	53.6	22.971	0.08	158.17	59600.94	4.373	1.26				
4/9/2008	385.97	94.509	0.368	38.61	15.641	0.06	141.34	55560.7	4.874	1.18				
4/10/2008	436.92	112.398	0.384	47.14	20.044	0.068	157.03	58841.86	3.949	0.91				
4/11/2008	461	118.341	0.421	47.74	20.263	0.071	157.76	58734.75	4.397	1.19				
4/12/2008	451.29	108.537	0.39	46.38	18.466	0.066	157.95	54940.98	3.74	1.08				
4/13/2008	466.05	112.65	0.41	50.27	20.101	0.073	157.72	55181.5	3.962	1.05				
4/14/2008	435.82	105.191	0.394	47.3	18.941	0.07	157.5	55195.84	4.307	0.87				
4/15/2008	449.51	110.028	0.41	46.96	19.118	0.07	157.21	55928.78	4.406	1.17				
4/16/2008	436.74	106.94	0.395	46.61	18.888	0.069	157.9	55791.23	4.324	1.16				
4/17/2008	402.41	100.993	0.374	47.36	19.672	0.072	155.82	57179.42	4.615	1.4	15.19	9.38	1.13	426.79
4/18/2008	451.95	111.302	0.405	44.55	18.268	0.066	158.47	56325.58	4.219	1.23	15.8	9.74	0.81	430.03
4/19/2008	436.15	106.427	0.393	46.83	18.984	0.069	151.74	55493.42	4.269	1.36	15.56	9.6	0.7	426.66
4/20/2008	423.86	103.158	0.384	44.27	17.922	0.066	158.03	55572.68	4.315	1.49	15.7	9.68	0.74	427.7
4/21/2008	415.61	101.57	0.37	44.22	17.983	0.065	158.33	55798.92	4.114	1.31	15.47	9.54	0.76	428.73
4/22/2008	446.83	108.26	0.4	48.5	19.492	0.071	158.28	55357.32	4.185	1.33	15.03	9.27	0.75	427.82
4/23/2008	457.61	111.088	0.403	50.22	20.272	0.073	159.4	55450.17	3.98	1.7	14.63	9.02	0.59	431.15
4/24/2008	423.06	104.584	0.376	46.73	19.161	0.068	159.16	56480.26	4.087	1.51	14.58	8.98	1.04	431.52
4/25/2008	436.14	107.389	0.387	48.58	19.827	0.071	158.54	56296.41	4.075	1.41	14.53	8.96	1.16	432.43
4/26/2008	425.7	104.265	0.377	47.15	19.107	0.069	158.94	55954.54	4.064	1.38	14.89	9.18	0.91	432.65
4/27/2008	435.21	106.566	0.386	49.42	20.05	0.072	158.89	55957.82	4.091	1.49	14.75	9.09	0.63	430.81
4/28/2008	423.16	102.948	0.376	49.99	20.264	0.074	157.44	55699.13	4.313	1.15	14.74	9.09	0.65	428.61
4/29/2008	468.2	114.497	0.408	59.83	24.173	0.087	158.19	55942.93	4.035	1.45	12.59	7.76	0.62	422.89
4/30/2008	458.78	113.052	0.4	40.14	16.352	0.058	158.36	56297.03	3.958	1.54	14.34	8.84	1.11	431.33
SUMMARIES:	464.20	125.26	0.45	48.45	20.02	0.072	155.51	56741.41	4.32	1.29	14.84	9.15	0.83	429.22
TOTALS:		90186.82			14412.86									

PINETREE BETHLEHEM

May-0

MONTHLY DATA SUMMARY

DATE	CO PPM	CO LB/HR	CO LB/MMBTU	NOx PPM	NOx LB/HR	NOx LB/MMBTU	STEAM K#/HR	STACK KSCFM	O2	OPACITY	UREA NH3 LB/HI	UREA GAL/HR	RATIO NH3/Nox	CATALYST BED TEMP
FULL SCALE	1000	325	1	500	270	0.75	180	75000	21	100				
5/1/2008	361.78	83.33	0.34	44.24	16.61	0.07	137.98	51781.89	4.74	1.56	11.1	6.84	0.66	418.12
5/2/2008	421.23	100.632	0.37	47.07	18.713	0.068	156.34	54859.52	4.007	1.56	13.13	8.09	1.01	431.42
5/3/2008	434.5	105.301	0.381	49.79	20.039	0.072	156.56	55337.33	3.916	1.82	13.63	8.4	0.92	431.89
5/4/2008	434.03	105.035	0.381	48.71	19.467	0.07	155.86	55265.48	3.929	1.8	13.75	8.48	0.99	431.48
5/5/2008	413.37	100.268	0.366	55.73	22.303	0.081	155.81	55491.1	4.058	1.83	12.9	7.95	0.89	432.22
5/6/2008	386.28	89.737	0.345	44.51	17.112	0.065	146.69	52700.05	4.223	1.79	13.62	8.4	1.38	429.65
5/7/2008	379.13	87.843	0.339	43.66	16.662	0.065	144.88	52454.01	4.211	1.83	13.5	8.32	1.43	432.03
5/8/2008	354.53	81.964	0.31	40.97	15.559	0.059	147.75	52240.9	3.957	1.77	13.77	8.5	1.21	435.03
5/9/2008	390.77	92.259	0.359	36.18	13.965	0.054	145.84	53305.99	4.308	2.26	14.29	8.81	1.35	436.5
5/10/2008	248.17	52.763	0.239	40.75	14.412	0.064	126.16	48513.6	4.974	1.54	12.59	7.77	1.37	412.62
5/11/2008	259.59	54.927	0.251	40.16	14.125	0.063	125.59	48243.19	5.04	1.47	12.39	7.64	1.49	413.62
5/12/2008	377.72	89.998	0.336	39.57	15.413	0.058	147.13	53618.39	4.217	1.45	14.38	8.87	1.51	436.21
5/13/2008	422.06	99.403	0.378	44.12	17.095	0.066	148.26	53284.35	4.303	2.1	13.95	8.6	1.45	436.89
5/14/2008	410.34	96.764	0.368	41.77	16.099	0.062	148.84	53362.52	4.302	2.36	14	8.64	1.08	438.07
5/15/2008	406.30	96.651	0.366	41.52	16.198	0.062	148.71	53671.27	4.353	2.61	14.28	8.81	1.15	438.83
5/16/2008	357.65	83.10	0.32	39.74	15.2	0.058	148.53	52582.13	4.17	1.85	14.51	8.95	1.27	438.65
5/17/2008	259.52	53.69	0.25	44.81	15.34	0.07	126.75	47196.3	4.885	1.36	11.78	7.26	1.08	418.62
5/18/2008	267.68	55.40	0.26	45.62	15.65	0.072	125.78	47295.21	5.129	1.41	11.53	7.11	0.99	415.68
5/19/2008	397.01	91.36	0.36	46.33	17.36	0.07	148.00	51880.87	4.47	2.18	14.17	8.74	1.03	432.7
5/20/2008	405.45	91.71	0.36	42.01	15.63	0.06	148.93	51380.88	4.23	2.05	14.3	8.82	1.23	439.26
5/21/2008	404.54	91.43	0.36	44.17	16.44	0.07	148.33	51091.76	4.33	2.46	14.14	8.72	1.21	440.18
5/22/2008	384.01	86.15	0.35	45.01	16.67	0.07	148.32	50709.66	4.37	2.08	14.40	8.88	1.22	437.59
5/23/2008	421.91	96.609	0.387	47.88	17.867	0.072	148.52	51457.87	4.561	2.14	13.99	8.63	1.15	440.57
5/24/2008	236.55	48.868	0.234	41.48	14.203	0.067	126.23	47051.38	5.326	1.56	12.76	7.87	1.3	417.17
5/25/2008	236.82	49.32	0.237	37.37	12.946	0.061	126.08	47505.75	5.475	1.53	14.25	8.79	1.51	416.27
5/26/2008	230.16	47.689	0.227	39.7	13.68	0.064	126.41	47328.09	5.344	1.59	13.43	8.28	1.4	418.62
5/27/2008	380.36	87.9	0.342	44.22	16.672	0.066	149.79	52140.07	4.366	1.95	14.96	9.23	1.23	442.11
5/28/2008	432.19	97.743	0.464	43.44	16.16	0.078	123.6	48677.2	6.828	1.6	11.96	7.37	1.26	415.54
5/29/2008	354.17	81.062	0.327	44.53	16.695	0.068	148.83	51651.83	4.645	2.92	14.79	9.12	1.5	438.24
5/30/2008	356.19	80.679	0.322	47.41	17.592	0.071	147.97	51133.01	4.44	2.8	14.6	9	1.38	439.47
5/31/2008	244.41	49.187	0.238	45.2	15.042	0.072	125.43	45938.02	5.148	2.3	12.15	7.49	0.96	419.19
SUMMARIES:	357.05	81.57	0.33	43.80	16.35	0.066	142.25	51262.89	4.59	1.92	13.52	8.33	1.21	429.82
TOTALS:		60690.62			12165.94									

PINETREE P[illegible]THLEHEM

MONTHLY DATA SUMMARY

Jun-0

DATE	CO PPM	CO LB/HR	CO LB/MMBTU	NOx PPM	NOx LB/HR	NOx LB/MMBTU	STEAM K#/HR	STACK KSCFM	O2	OPACITY	UREA NH3 LB/HI	UREA GAL/HR	RATIO NH3/Nox	CATALYST BED TEMP
FULL SCALE	1000	325	1	500	270	0.75	180	75000	21	100				
6/1/2008	251.55	51.087	0.25	44.49	14.948	0.072	125.72	46298.75	5.381	2.08	12.03	7.42	1.06	418.61
6/2/2008	369.81	84.565	0.334	47.69	17.83	0.072	147.36	51482.09	4.413	2.48	13.92	8.58	1.02	436.79
6/3/2008	308.18	71.222	0.276	38.06	14.38	0.056	150.95	52347.54	4.265	2.23	15.84	9.77	3.67	435.97
6/4/2008	293.04	69.568	0.264	61.13	23.763	0.091	150.78	53754.03	4.367	2.7	13.67	8.43	0.89	417.23
6/5/2008	287	68.542	0.258	43.97	17.062	0.066	149.75	53976.47	4.342	2.76	14.84	9.15	1.09	433.49
6/6/2008	294.51	71.632	0.265	49.26	19.654	0.073	152.61	54912.34	4.315	2.86	15.27	9.41	1.07	433.6
6/7/2008														
6/8/2008	275.91	66.881	0.406	65.1	25.642	0.116	110.63	54314.75	6.307	0.91	7.67	4.73	0.55	362.8
6/9/2008	329.26	88.087	0.292	45.58	19.753	0.067	148	60043.99	4.199	0.94	14.37	8.87	0.99	431.81
6/10/2008	458.07	109.681	0.529	44.72	18.628	0.086	123.94	56853.9	6.367	1.11	11.35	7	0.79	419.66
6/11/2008	338.36	91.414	0.309	42.53	18.793	0.064	151.17	61430.91	4.475	0.76	15.25	9.41	1.05	433.19
6/12/2008	322.04	87.914	0.297	41.91	18.544	0.064	150.34	61612.62	4.578	1	14.67	9.05	1.02	433.96
6/13/2008	302.58	81.099	0.279	41.1	17.961	0.062	150.09	60933.47	4.566	1.03	13.64	8.41	0.99	432.79
6/14/2008	216.02	52.863	0.203	42.9	17.329	0.066	134.14	55806.58	4.756	0.99	12.22	7.53	0.9	418.35
6/15/2008	214.45	52.565	0.201	39.59	16.015	0.061	134.06	56044.65	4.751	1	12.22	7.53	0.94	416.27
6/16/2008	316.08	85.051	0.284	42.84	18.8	0.064	150.91	61041.8	4.299	1.11	14.58	8.99	1.01	431.61
6/17/2008	305.2	83.095	0.272	43.39	19.218	0.064	150.61	61563.28	4.165	1.03	14.41	8.88	1.02	433.24
6/18/2008	265.96	72.47	0.236	46.61	20.814	0.068	150.46	61906.86	4.114	1.11	14.16	8.73	0.91	431.27
6/19/2008	271	74.531	0.24	49.18	21.853	0.072	149.42	61853.97	4.056	1.08	13.55	8.36	0.81	433.26
6/20/2008	240.925	65.982	0.216	42.05	18.897	0.062	150.56	62208.73	4.206	0.96	15.14	9.34	1.03	427.03
6/21/2008	170.61	42.931	0.158	39.49	16.414	0.059	134.1	57634.66	4.554	1.08	13.21	8.15	0.98	410.73
6/22/2008	184.83	46.499	0.171	41.92	17.44	0.064	133.94	57409.49	4.592	1.12	12.7	7.83	0.96	413.57
6/23/2008	261.87	72.566	0.235	44.07	20.016	0.065	150.69	62801.89	4.296	1.22	14.22	8.77	0.86	426.82
6/24/2008	263.54	73.88	0.235	43.18	19.605	0.063	150.53	63434.8	4.192	1.08	14.87	9.17	0.98	428.26
6/25/2008	270.78	74.862	0.243	40.65	18.423	0.06	150.99	62956.76	4.243	0.96	14.81	9.13	0.99	428.22
6/26/2008	319.53	87.337	0.286	43.11	19.139	0.064	151.24	61927.95	4.247	1.03	13.81	8.51	0.96	429.79
6/27/2008	335.98	91.307	0.297	39.37	17.494	0.057	151.35	61552.78	4.128	1.12	14.07	8.68	1.06	430.42
6/28/2008	214.22	53.48	0.201	40.84	16.787	0.063	134.37	57037.22	4.739	1.06	12.25	7.55	0.86	417.9
6/29/2008	203.33	50.629	0.188	44.78	18.433	0.068	134.76	56994.02	4.616	1.19	11.67	7.2	0.86	417.28
6/30/2008	306.78	82.165	0.272	40.86	17.922	0.06	151.38	60871.19	4.105	1.11	14.34	8.84	0.98	430.58
SUMMARIES:	282.46	72.55	0.27	44.50	18.67	0.068	143.96	58310.60	4.54	1.35	13.61	8.39	1.04	424.64
TOTALS:		50493.72			12997.38									

SUEZ
Energy Generation NA

State of Connecticut
Department of Public Utility Control
Ten Franklin Square
New Britain, CT 06051

October 17, 2008

REF: CT00218-07

Dear Commissioners:

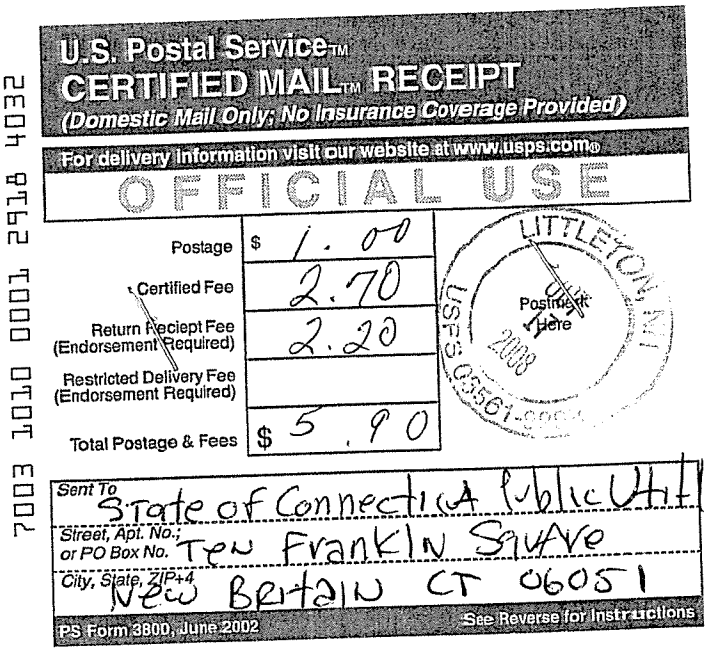
Attached you will find our quarterly affidavit and supporting documentation that the average emission rate of Pinetree Power, Inc. is equal to or less than .075 pounds of nitrogen oxides per million BTU of heat input for Class I Certificates.

Should you have any questions or require additional information please contact me at (603) 444-9993 x 12

Sincerely,

Mark D Driscoll

Mark Driscoll
Plant Manager
Pinetree Power, Inc.



SUEZ Energy Generation NA, Inc.
BETHLEHEM Power Plant
1241 Whitefield Road
Bethlehem NH 03574
Tel. 603 444-9993 fax 603 444-6476
Email marie.raynor@suezenergyna.com
www.suezenergyna.com

AFFIDAVIT OF MARK DRISCOLL

Mark Driscoll, being duly sworn, deposes and says:

(1) I am the plant manager and duly authorized representative of Pinetree Power, Inc. for the purpose of certifying Class I RPS certificates in Connecticut.

(2) Attached to this affidavit are accurate copies of emissions data for Pinetree Power, Inc. facility for the months of July, August & September 2008.

(3) The attached emissions data demonstrate that the Pinetree Power, Inc. average NOx emission rate during the third quarter of 2008 was equal to or less than the 0.075 lbs/mmBTU threshold level required for Class I certificates.

(4) Further, the affiant sayeth naught.

Date: 10/17/08

Mark Driscoll

Mark Driscoll

State of New Hampshire
County of Grafton, SS

Personally appeared the person signing the above affidavit and swore that it is true to the best of his knowledge and belief.

Date: 10/17/08

Nancy C Bisson

Notary Public

NANCY C. BISSON
Notary Public - New Hampshire
My Commission Expires May 16, 2012

GSI Emission Chart 2008 **BETHLEHEM** **MSS 337** **CT00218-07**

2008	Operation	Generation	Generation	CO	CO	CO	NOX	NOX	NOX	NOX	SOX	SOX	SOX	Particulate	Particulate	Particulate	Mercury
	Hours	Gross MWh	Net MWh	Tons	lbs.	lb/MWh	Tons	lbs.	lb/MWh	lb/MMbtu	lb/MWh	Tons	lbs.	lb/MWh	Tons	:lbs.	lb/MWh
January	744	12337.78	11367	44.82	89640	7.886	20.07	40140	3.531	0.187	0.0104	0.0640	127.95	0.0452	0.2790	558.00	0.000066
February	668.17	11047.9	10181	44.01	88020	8.646	17.31	34620	3.400	0.180	0.0104	0.0575	114.91	0.0454	0.2506	501.13	0.000066
March	478	7708	7126	37.01	74020	10.387	10.39	20780	2.916	0.160	0.0107	0.0411	82.21	0.0465	0.1793	358.50	0.000068
April	714.25	12123.92	10948	45.09	90180	8.237	7.2	14400	1.315	0.072	0.0101	0.0614	122.84	0.0442	0.2678	535.69	0.000066
May	740.07	11344.37	10272	30.35	60700	5.909	6.083	12166	1.184	0.066	0.0112	0.0636	127.28	0.0489	0.2775	555.05	0.000073
June	698.44	10800.93	9757	25.25	50500	5.176	6.498	12996	1.332	0.068	0.0111	0.0601	120.12	0.0485	0.2619	523.83	0.000073
July	727.22	11649.65	10533	28.15	56300	5.345	7.31	14620	1.388	0.690	0.0107	0.0625	125.07	0.0468	0.2727	545.42	0.000070
August	672.51	9987.84	9021	18.70	37400	4.146	6.61	13220	1.465	0.071	0.0116	0.0578	115.66	0.0505	0.2522	504.38	0.000076
September	660	10998.48	10025	21.54	43080	4.297	4.99	9980	0.996	0.064	0.0103	0.0568	113.51	0.0450	0.2475	495.00	0.000067
October					0	#DIV/0!		0	#DIV/0!	0.000	#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
November					0	#DIV/0!		0	#DIV/0!	0.000	#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
December					0	#DIV/0!		0	#DIV/0!	0.000	#DIV/0!	0.0000	0.00	#DIV/0!	0.0000	0.00	#DIV/0!
Total	6102.66	97998.87	89230	294.92	589840		86.461	172922		0.13		0.5248	1049.5355		2.2885	4576.9950	

PINETF BETHLEHEM

J. 08

MONTHLY DATA SUMMARY

DATE	CO PPM	CO LB/HR	[illegible] LB/MMBTU	NOx PPM	NOx LB/HR	[illegible] LB/MMBTU	STEAM K#/HR	STACK KSCFM	O2	OPACITY	UREA NH3 LB/HR	UREA GAL/HR	[illegible] NH3/NOx	CATALYST BED TEMP
FULL SCALE	1000	325	1	500	270	0.75	160	75000	21	100				
7/1/08	298.23	80.466	0.266	42.26	18.562	0.062	151.76	61059.46	4.221	1.06	14.91	9.19	1.04	429.97
7/2/08	295.18	79.55	0.268	46.13	20.344	0.069	150.7	61140.01	4.387	1.4	14.73	9.08	1.02	428.59
7/3/08	331.61	89.041	0.294	41.8	18.212	0.061	151.36	60545.14	4.172	1.4	14.44	8.9	1	428.64
7/4/08	212.57	52.46	0.2	44.08	17.911	0.066	133.63	56450.73	4.805	1.11	12.57	7.75	0.92	412.66
7/5/08	217.3	53.931	0.207	43.94	18.003	0.069	133.76	56774.43	4.925	1.22	12.64	7.8	0.9	413.1
7/6/08	215.52	53.416	0.204	45.12	18.469	0.069	134.67	56656.59	4.806	1.16	12.26	7.56	0.83	416.57
7/7/08	337.15	91.023	0.305	46.16	20.34	0.069	151.18	61166.8	4.386	1.52	14.66	9.16	0.9	427.56
7/8/08	337.85	89.534	0.298	48.83	21.213	0.071	151.88	60112.65	4.141	1.49	12.29	7.56	0.75	428.02
7/9/08	303.83	79.754	0.266	56.21	24.132	0.081	152.29	59440.67	3.985	1.41	11.11	6.85	0.61	426.05
7/10/08	289.9	76.34	0.262	61.98	26.771	0.092	151.12	59886.6	4.361	1.13	11.16	6.88	0.54	425.58
7/11/08	309.83	81.563	0.285	65.53	28.146	0.099	150.13	59690.61	4.594	1.53	11.79	7.27	0.55	424.92
7/12/08	200.6	48.076	0.187	40.67	16.096	0.062	134.4	54596.32	4.693	1.45	9.77	6.02	1.02	413.24
7/13/08	187.71	44.516	0.173	38.88	15.261	0.059	135.19	54180.78	4.576	1.48	10.64	6.56	0.91	412.33
7/14/08	268.97	76.082	0.26	43.15	18.469	0.063	150.45	59344.06	4.207	1.49	11.42	7.04	0.87	425.57
7/15/08	339.34	92.779	0.304	44.09	19.892	0.065	151.89	62533.47	4.21	1.67	14.2	8.76	2.36	431.54
7/16/08	356.11	96.17	0.314	56.97	26.167	0.085	158.75	61790.7	4.066	1.63	11.63	7.17	0.92	420.22
7/17/08	358.9	96.182	0.313	71.9	31.622	0.103	159.01	61326.07	3.842	1.66	9.6	5.92	0.69	411.24
7/18/08	332.32	90.089	0.291	49.45	22.089	0.071	158.35	61932.54	3.947	1.71	11.39	7.02	0.74	430.6
7/19/08	425.46	112.998	0.511	46.32	20.161	0.077	133.98	58106.91	5.906	1.76	9.19	5.66	0.58	417.83
7/20/08	400.01	107.779	0.346	43.83	19.467	0.062	158.68	61634.22	3.763	1.46	11.63	7.17	0.74	429.73
7/21/08	352.49	96.024	0.304	47.66	21.442	0.067	159.16	62398.13	3.721	1.34	11.67	7.2	0.72	431.15
7/22/08	263.4	68.545	0.227	51.69	21.858	0.074	143.38	58833.97	3.787	1.39	11.35	7	0.7	427.43
7/23/08	287.3	77 921	0.254	58.22	25.78	0.085	152.7	61361.61	4.055	1.16	10.99	6.77	0.59	427.02
7/24/08	292.31	79.031	0.253	49.1	21.45	0.07	151.35	60820.63	3.832	2.17	13.29	8.19	0.81	428.94
7/25/08														
7/26/08	257.16	59.966		62.87			76.25	42966.23	10.916	3.45	4.46	2.75	0.33	278.7
7/27/08	186.83	45.598	0.166	39.52	15.901	0.057	134.8	55750.14	4.079	1.23	12.71	7.84	1.03	416.59
7/28/08	279.82	75.494	0.244	46.65	20.589	0.067	151.35	61002.03	3.849	1.34	14.49	8.93	0.96	428.19
7/29/08	302.14	82.805	0.266	45.2	20.153	0.065	151.84	61855.17	4.016	1.32	14.93	9.21	0.94	428.27
7/30/08	296.57	81.517	0.262	46.8	20.819	0.068	151.11	61757.42	4.064	1.38	14.61	9.01	0.91	429.68
7/31/08	324.13	87.031	0.279	45.56	19.84	0.065	151.65	60780.69	3.789	1.33	14.35	8.85	0.94	428.97
SUMMARIES:	296.03	78.19	0.27	49.09	21.01	0.072	145.89	59196.56	4.47	1.50	12.17	7.50	0.86	419.38
TOTALS:		56296.87			14619.86									

PINETRE' :THLEHEM MONTHLY DATA SUMMARY

Aug-0[illegible]

DATE	CO PPM	[illegible] LB/HR	CO LB/MMBTU	NOx PPM	[illegible] LB/HR	NOx LB/MMBTU	STEAM K#/HR	STACK KSCFM	O2	OPACITY	NH3 LB/HR	[illegible] GAL/HR	RATIO NH3/Nox	CATALYST BED TEMP
FULL SCALE	1000	325	1	500	270	0.75	180	75000	21	100				
8/1/08	342.75	94.00	0.30	46.06	20.38	0.07	151.78	61566.04	3.86	1.45	13.44	8.29	0.93	429.81
8/2/08	191.63	47.12	0.171	39.96	16.206	0.058	146.09	56113.44	4.123	1.25	12	7.4	1	416.01
8/3/08	190.32	47.696	0.174	40.17	16.588	0.06	134.58	57274.87	4.425	1.38	12.47	7.69	1.01	415.42
8/4/08	118.83	27.853					97.55	34073.98	13.102	1.31	5.25	3.23	0.48	342.37
8/5/08	132.21	6.627					66.56	12054.32	20.025	2.28	0.06	0.02	0.01	134.61
8/6/08	32.18	1.569					50.6	11549.25	20.152	2.42	0.06	0.02	0.01	84.83
8/7/08	417.17	98.343	0.835	34.44	13.551	0.097	79.09	47490.69	10.382	1.74	7.02	4.32	0.46	265.56
8/8/08	168.16	40.947	0.15	46.33	18.605	0.068	134.05	55670.93	4.104	1.36	13.56	8.37	0.96	414.87
8/9/08	166.04	40.908	0.149	51.47	20.877	0.075	133.67	56317.92	4.169	1.27	13.66	8.55	0.89	414.26
8/10/08	182.76	46.405	0.168	43.26	18.097	0.065	134.16	58017.75	4.459	1.29	14.2	8.76	0.99	417.44
8/11/08	227.5	60.028	0.205	82	35.8	0.119	143.92	59927.05	4.295	1.78	10.15	6.26	0.57	386.54
8/12/08	165.66	40.899	0.155	43.64	17.605	0.067	128.29	56099.83	4.668	1.39	13.31	8.21	0.99	409.69
8/13/08	153.38	37.372	0.144	48.56	19.48	0.074	124.57	55607.67	4.683	1.53	11.65	7.18	0.81	408.66
8/14/08	192.45	46.75	0.184	41.06	16.486	0.064	123.19	55503.27	4.888	1.53	10.78	6.65	0.89	417.33
8/15/08	170.03	40.451	0.161	40.94	16.094	0.063	122.4	54397.33	4.794	1.47	11.01	6.78	0.91	417.7
8/16/08	169.19	41.38	0.16	46.65	18.959	0.07	127.97	55945.91	4.371	1.49	11.22	6.92	0.83	419.75
8/17/08	161.66	39.63	0.15	43.22	17.46	0.064	128.17	56020.69	4.468	1.46	11.51	7.09	0.8	420.07
8/18/08	148.51	35.64	0.14	42.29	16.71	0.064	127.7	54708.6	4.621	1.56	11.34	6.99	0.87	417.38
8/19/08	142.40	34.38	0.13	47.12	18.79	0.07	127.77	55262.22	4.62	1.47	11.35	7	0.88	417.91
8/20/08	154.43	36.02	0.14	43.82	17.87	0.07	131.07	56385.68	4.66	1.52	11.17	6.89	1.19	417.47
8/21/08	165.28	41.71	0.15	48.42	20.15	0.07	139.47	57514.32	4.19	1.56	11.03	6.8	0.85	419.45
8/22/08	177.91	44.93	0.16	49.96	20.81	0.07	140.52	57722.71	4.20	1.56	11.44	7.05	0.87	423.22
8/23/08	182.91	46.244	0.163	49.45	20.593	0.072	141.3	57766.91	4.099	1.58	11.53	7.11	0.72	427.27
8/24/08	181.45	45.463	0.16	45.61	18.854	0.066	141.16	57370.56	3.965	1.61	11.48	7.08	0.79	426.76
8/25/08	180.68	44.898	0.16	48.1	19.674	0.07	141.45	56853.42	4.053	1.44	11.61	7.16	0.8	424.32
8/26/08	195.25	49.338	0.18	52.15	21.726	0.078	134.32	57606.04	4.486	1.51	11.19	6.9	0.69	421.46
8/27/08	245.21	64.645	0.214	54.57	23.669	0.079	152.99	60093.34	3.877	1.67	13.15	8.11	1.23	427.55
8/28/08	285.45	76.677	0.243	55.31	24.46	0.077	159.05	61346.96	3.556	1.58	14.8	9.12	0.77	435.98
8/29/08	335.07	90.028	0.293	54.14	23.991	0.078	159	61514.98	3.925	1.51	14.26	8.79	0.83	435.49
8/30/08	356.63	96.28	0.311	43.07	19.164	0.062	159.86	61739.92	3.681	1.6	14.42	8.89	0.95	434.27
8/31/08	338.46	91.747	0.3	39.86	17.816	0.058	158.7	62003.81	4.068	1.47	14.35	8.85	1.08	433.21
SUMMARIES:	202.31	50.26	0.21	47.22	19.67	0.071	130.36	53603.88	5.78	1.55	11.12	6.85	0.81	392.80
TOTALS:		37391.33			13216.39									

PINETREE THLEHEM

Sep-0_

MONTHLY DATA SUMMARY

DATE	CO PPM	CO LB/HR	CO LB/MMBTU	NOx PPM	NOx LB/HR	NOx LB/MMBTU	STEAM K#/HR	STACK KSCFM	O2	OPACITY	NH3 LB/HR	UREA GAL/HR	RATIO NH3/Nox	CATALYST BED TEMP
FULL SCALE	1000	325	1	500	270	0.75	180	75000	21	100				
9/1/08	361.81	98.646	0.323	39.76	17.873	0.058	158.4	62338.56	4.157	1.65	13.55	8.36	0.96	433.99
9/2/08	415.81	112.216	0.363	39.64	17.625	0.057	161.2	61721.24	3.881	1.6	13.57	8.36	0.93	435.4
9/3/08	426.11	114.436	0.368	37.26	16.47	0.053	159.81	61464.6	3.781	1.61	13.62	8.52	1.01	437.06
9/4/08	411.76	111.935	0.357	41.27	18.485	0.059	159.72	62165.83	3.826	1.61	14.45	8.91	1	438
9/5/08	388.5	105.571	0.337	40.32	18.05	0.057	161.05	62124.7	3.785	1.88	14.27	8.8	1.02	435.48
9/6/08	407.82	110.323	0.351	40.79	18.207	0.058	160.28	61828.54	3.72	1.65	14.34	8.84	0.99	435.23
9/7/08	381.96	102.697	0.332	48	21.348	0.069	159.35	61658.22	3.671	1.51	15.23	9.39	0.96	432.5
9/8/08	353.2	96.919	0.316	47.8	21.54	0.07	159.58	62831.86	4.187	1.54	15	9.25	0.98	436.58
9/9/08	365.86	98.606	0.356	41.36	18.597	0.063	152.06	60785.86	4.99	1.59	13.02	8.03	0.95	428.63
9/10/08	6.12	0.726					2.23	30524.57	20.286	5.14	0.04	0.02	0	126.54
9/11/08	1.07	0.052					2.25	11200.92	20.373	2.35	0.04	0.02	0.02	44.93
9/12/08	406.88	124.592		48.8	19.65		58.38	40249.91	13.353	3.48	2.79	1.71	0.22	189.74
9/13/08	265.86	71.392	0.23	44.84	19.814	0.064	157	61440.54	3.802	1.64	14.03	8.65	0.97	432.71
9/14/08	305.21	81.976	0.26	43.38	19.214	0.061	157.66	61371.7	3.578	1.73	14.03	8.65	0.95	433.43
9/15/08	271.24	74.593	0.233	59.38	26.729	0.084	157.55	63170.97	3.718	1.58	13.25	8.17	0.76	430.89
9/16/08	250.45	69.791	0.222	47.77	21.948	0.069	157.8	63798.02	4.045	1.71	15.54	9.59	0.9	435.01
9/17/08	242.3	66.272	0.217	49.01	22.159	0.072	156.59	62468	4.216	1.71	15.63	9.64	1.01	432.01
9/18/08	251.11	67.832	0.225	42.12	18.729	0.062	155.71	61907.59	4.19	1.64	14.93	9.2	1.03	428.5
9/19/08	215.41	58.499	0.196	44.1	19.814	0.066	155.66	62116.7	4.418	1.66	15.03	9.26	1.04	419.09
9/20/08	207.47	55.408	0.185	43.32	19.079	0.063	155.17	61061.95	4.18	1.58	15.29	9.43	1.09	420.26
9/21/08	206.2	54.795	0.184	44.86	19.674	0.066	155.33	60789.54	4.146	1.79	15.09	9.3	1.02	421.45
9/22/08	219	59.48	0.202	44.44	19.809	0.067	155.21	62076.86	4.523	1.66	15.66	9.67	0.92	424.99
9/23/08	216.29	58.247	0.196	47.67	21.141	0.071	154.79	61570.94	4.32	1.67	14.59	9	0.97	421.91
9/24/08							155.62	61136.35	4.298	1.83	16.79	9.28	0.98	423.76
9/25/08							155.95	61190.57	4.262	1.79	15.28	9.42	0.9	423.51
9/24/08							155.82	61136.35	4.298	1.83	16.79	9.28	0.98	423.76
9/27/08							156.42	60578.45	3.929	1.74	15.05	9.28	0.89	423.13
9/28/08							156.91	60665.78	3.8	1.77	15.13	9.33	0.89	424.3
9/29/08							156.29	61273.19	3.958	1.94	14.78	9.12	0.87	424.53
9/30/08							156.07	60727.26	3.926	1.78	12.19	7.52	0.72	401.52
SUMMARIES:	285.98	78.05	0.27	44.57	19.81	0.064	143.54	58245.85	5.46	1.89	13.31	8.13	0.86	397.37
TOTALS:		43084.94			9982.92									

360 Old Colony Road • Suite 1
Norton, MA 02766
(508) 226-6700 • Fax (508) 226-6778

FINAL REPORT

PINETREE BETHLEHEM WOOD-FIRED POWER STATION
NOx CONTINUOUS EMISSION MONITORING SYSTEM
RELATIVE ACCURACY TEST AUDIT AND
COMPLIANCE PARTICULATE EMISSIONS TEST PROGRAM

2008

Source Designations:
Pinetree Power, Inc. - Bethlehem Station
Wood -Fired Boiler CEMS
1241 Whitefield Road
Bethlehem, New Hampshire 03574

Concerning:
Title XXXIV Public Utilities
Chapter 362-F Electric Renewable Portfolio Standard

Prepared for:
State of New Hampshire
Department of Environmental Services
Air Resources Division
64 North Main Street
Concord, NH 03302-2033

Prepared by:
CEMServices Inc.
360 Old Colony Road, Suite 1
Norton, MA 02766

The information contained in this report is true and accurate to the best of my knowledge.

Sean MacKay
Manager of Environmental Services

4/28/2008
Date

1. INTRODUCTION

Pinetree Power, Inc. operates a wood-fired process boiler at their Bethlehem, New Hampshire facility. This boiler is equipped with a Continuous Emissions Monitoring System (CEMS) that monitors the concentrations of Nitrogen Oxides (NOx), Carbon Monoxide (CO), Oxygen (O_2), opacity and gas flow in the combustion gases exiting the boiler. Pinetree Bethlehem has recently installed a NOx catalyst reduction system (SCR/NSCR) to qualify for renewable energy certificates in the New England power market.

As required by the New Hampshire Department of Environmental Services (NHDES) and the Title XXXIV Public Utilities Chapter 362-F Electric Renewable Portfolio Standard, Pinetree Bethlehem is required to show NOx and Particulate compliance to qualify for renewable energy certificates.

As specified in 40 CFR 60, Appendix B, PS 2 and 3 Relative Accuracy Test Procedures, CEMServices conducted Reference Method (RM) tests and acquired emission data for comparison to data generated by the facility's CEMS. Nine test runs were conducted and the Relative Accuracy (RA) of each facility monitor was calculated using the following equation:

$$RA = \{|d| + |CC|\} \times 100 / RM$$
$$CC = t \times S_d / (n)^{0.5}$$

Where:
RA = Relative Accuracy, percent
|d| = Mean absolute value of the differences between the CEMS and RM values
|CC| = Absolute value of the 2.5 percent error confidence coefficient
RM = Average Reference Method value or emission standard (or permit limit)
t = student t-value (2.5 percent error, one-tailed)
Sd = Standard deviation of the differences between the CEMS RM values
n = number of data points (9)

The RA for NOx was calculated for the following units: NOx (LB\MMBtu, LB/HR). Table 1-1 is a RATA test program overview indicating the parameter tested for, the test methodologies used, and the allowable relative accuracy's (RA's) where applicable.

TABLE 1-1
RATA TEST PROGRAM OVERVIEW

PARAMETER	EPA RM	RA ALLOWED
NOx	7E	20 % of Avg. RM 10 % of Standard
O2/CO2	3A	1 % Difference
FLOW	1 and 2	N/A
MOISTURE	4	N/A

N/A - Not Applicable

1. INTRODUCTION

Table 1-2 is an overview of the particulate testing indicating the parameters tested and the EPA Methodology used.

TABLE 1-2
PARTICULATE TEST PROGRAM OVERVIEW

Parameter	EPA Test Method
Filterable Particulate Matter (PM)	Method 5

PM testing was performed in conjunction with the RATA testing. Three one-hour PM tests were performed. Each one hour PM test contained three RATA tests. The flow and moisture from each one-hour PM test was used for three RATA tests. Testing took place March 28th, 2008.

All Reference Method LB/MMBtu emission rates were calculated using the EPA default fuel factor (Fd) for wood of 9240 or as applicable (Fc) 1892. All relative accuracy's were calculated based on nine (9) test runs.

Sean MacKay was the Project Director for these test programs. He was responsible for all phases of field-testing, data reduction, and report generation. He was assisted by Christopher Cutting and Michael Reardon also of CEMServices.

2. SUMMARY OF RESULTS

The Data Accuracy Assessment of the Continuous Emission Monitoring System installed on the wood-fired boiler at Pinetree Bethlehem was determined with a RATA. Table 2-1 summarizes the results of the RATA test program. Individual relative accuracy calculation sheets can be found in Appendix B of this report. Table 2-2 is a summary of the particulate results.

TABLE 2-1
RELATIVE ACCURACY TEST AUDIT RESULTS
MARCH 28, 2008

RATA TEST DATA				RELATIVE ACCURACY		
Parameter	**Average RM Value**	**Average Plant Value**	**Mean Difference**	**Actual (%)**	**Limit (%)**	**Result**
O_2 (%wv)	4.02	4.12	0.10	3.4	1 % (ABS. DIFF)	PASS
NOx (LB/MMBtu)	0.051	0.053	0.002	5.0	20 RM 10 STD	PASS
NOx (LB/HR)	15.90	15.18	0.72	8.0	20 RM 10 STD	PASS

Note - RM is the relative accuracy calculated using the average Reference Method value.
STD is the relative accuracy calculated using the emission standard.
DIFF is the absolute mean difference in concentration.

TABLE 2-2
PARTICULATE MATTER TEST RESULTS
MARCH 28, 2008

RUN #	START	STOP	PARTICULATE	
			LB/MMBTU	LB/HR
1	09:00	10:10	0.021	6.44
2	10:40	11:55	0.017	5.21
3	12:15	13:25	0.008	2.59
Average			**0.015**	4.75
Limit			**0.03**	
Result			**PASS**	

3. FACILITY DESCRIPTIONS

A. General

Pinetree Power - Bethlehem, New Hampshire facility is a wood-fired power plant consisting of one boiler rated at 17 megawatts. Combustion gases from the boiler are directed through an electrostatic precipitator for particulate removal, then a SCR/NSCR for NOx reduction and finally vented through a 198 foot steel stack.

B. Continuous Emission Monitoring Systems

The CEMS at Pinetree Bethlehem monitors the oxygen, carbon monoxide, nitrogen oxides, opacity and volumetric flow emissions from the facility. The carbon monoxide and nitrogen oxides portion of the CEMS is a dry-extractive design. Sample flue gas is extracted from a stainless steel probe located at the I.D. fan discharge. Filters at the probe location remove particulate from the gas stream. The gas sample is then transferred through a heated sample line to a condensate collector for moisture removal. The oxygen monitor is an in-situ design and analyzes on a wet basis. This monitor is located at the stack sampling location (second platform level). Table 3-1 is a description of the analyzers at the facility.

TABLE 3-1
PINETREE BETHLEHEM FACILITY CEMS

Parameter	Make / Model #	Range	Serial #
O_2	Westinghouse/218A	0-25 %	8601039
NOx	UNOR / 6N	0-500 PPM	704067
CO	UNOR / 6N	0-1000 PPM	793871

The output of each monitor is recorded by an Iconics Genesis DAS system.

3. FACILITY DESCRIPTION

C. Test Locations

All reference method testing took place at the sample port locations on the stack. The stack location at Bethlehem has two sampling ports situated at ninety (90) degrees from each other. The stacks inner diameter is 7.5 feet. Each port has 4-inch inner diameter. This location is 60.5 or 8.1 duct diameters downstream from the point where the ESP meets the stack, and 60 feet or 8.0 duct diameters upstream from the stack outlet. Figure 3-1 is a schematic of the test location.

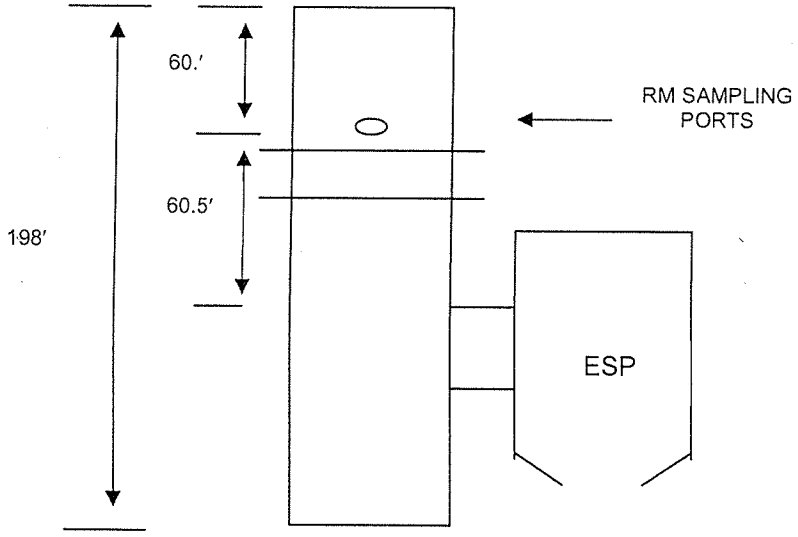


Figure not drawn to Scale

FIGURE 3-1
PINETREE BETHLEHEM STACK SAMPLING LOCATION

4. REFERENCE METHOD TEST PROCEDURES

A. Relative Accuracy Test Audit

The data accuracy assessment of the CEMS was conducted using a Relative Accuracy Test Audit. This audit consists of comparing data generated by the facility CEMS to data acquired simultaneously using US EPA reference test methods. Nine (9) twenty-one (21) minute test runs were conducted. These nine runs were used to determine the RA of each parameter. Flow and moisture sampling was conducted at the stack sampling location along with NOx and O_2 / CO_2 thus ensuring all data to be representative of the facility emissions.

The clock time of the data acquisition system in the CEMServices mobile laboratory was set exactly to the facility CEMS time. The start and stop time of each test run was documented on the facility's data acquisition system. During each test run, all CEM and process operation data was printed out.

B. Velocity Traverse - EPA Test Method 1

Method 1 procedures delineate velocity traverses for stationary sources. Based upon EPA Method 1 criteria, a total of twelve (12) traverse points (six per port) were used at each facility to determine the volumetric flowrate. The PM/flow/moisture sampling probe was marked according to the measurements in the following tables.

TABLE 4-1
PINETREE BETHLEHEM TRAVERSE POINT LOCATIONS

Traverse Point #	Distance % of Diameter	Distance (inches) From Inside Surface of Stack
1	4.4	3.96
2	14.6	13.14
3	29.6	26.64
4	70.4	63.36
5	85.4	76.89
6	95.6	86.04

The pitots were connected to a manometer using 1/8 inch ID Tygon tubing. These connections were checked for leaks prior to the initiation of testing and at the conclusion of run 12. A cyclonic flow check was performed in accordance with Method 1-2 to verify the absence of cyclonic flow. These results are presented in Appendix G.

C. Flow Rate - EPA Test Method 2

Method 2 was used for the determination of stack gas velocity and volumetric flow rate. Before the velocity traverse is started, a leak check is conducted on the pitots, and the manometer is leveled. The velocity head and stack gas temperature was recorded for each of the required sampling points. Each test run was sixty (60) minutes in length (5 minutes per point).

4. REFERENCE METHOD TEST PROCEDURES

D. Moisture Content - EPA Test Method 4

Method 4 is used for the determination of moisture content in stack gas. This method consists of extracting a known volume of gas sample and quantifying the removed moisture portion of this sample. This testing was conducted concurrently with the particulate sampling.

Before each test run the impingers used to remove condensate from the gas was prepared. A total of four impingers were loaded according to the method. The sampling train was then assembled and the sampling probe heated. The train was then checked for leaks by plugging the sample inlet and challenging the train with a vacuum of 15 inches of H20. All leak rates were below 0.02 CFM. The initial meter volume was recorded and the probe was positioned at the first traverse point. Sampling was conducted isokinetically for the entire run. At the completion of each test run the final meter volume was recorded and another leak check was conducted. The impingers were recovered and their final volumes recorded.

E. Particulate Matter - EPA Test Method 5

This method is used for the determination of particulate emissions from stationary sources. Particulate matter is drawn isokinetically from the source and collected onto a glass fiber filter.

Before each test run the impingers used to remove condensate from the gas were prepared. A total of four impingers were loaded according to the method. Inserting a desiccated tared filter into the glass filter holder assembles the remainder of the sample train. The filter holder is then placed into the hotbox and the sample probe and nozzle are attached. The hotbox and sample probe were heated to approximately 248 °F. Prior the start of each run a leak check was performed from the end of the nozzle at a vacuum of 15 inches of mercury.

The run was then initiated and isokinetic sampling took place. The entire stack was traversed according to the sample points specified in Method 1. Five (5) minute readings were taken during the one (1) hour test run. At the conclusion of the test a post leak check was conducted at the highest vacuum obtained during the run and the sample train was move to the cleanup site where it was recovered in strict accordance with Method 5 Sample Recovery Procedures as follows:

Container #1. The filter was carefully removed from the filter holder and placed in its identified petri dish container.

Container #2. Taking care to see that dust on the outside of the probe or other exterior surfaces did not get into the sample, particulate matter from the nozzle, probe liner and front half of the filter holder was quantitatively recovered by washing these components with acetone into a glass or nalgene container. The inside of each component was brushed and rinsed until the acetone rinse shows no visible particles, after which a final rinse of the inside surface was performed.

4. REFERENCE METHOD TEST PROCEDURES

F. CEM Calibration Procedures / Nitrogen Oxides - EPA Test Method 7E

Method 7E is used for the determination of Nitrogen Oxides emissions from stationary sources using instrumental analyzer procedures. In addition, all calibration procedures and requirements for the other instrumentation methods used (Methods 3A) are specified in this method.

Before any testing is conducted, the calibration span of all test analyzers was set up so that expected source emissions was at least twenty (20) percent of this span and would not exceed this span. Once this span is determined, calibration gases were chosen within this span. Only gases prepared according to EPA Protocol G1/G2 were used. Certificates of analysis for all gases were provided on-site at the time of testing. Analyzer calibration error checks were conducted by challenging each analyzer with a zero, mid, and high gas. The actual value of the high gas used was the calibration span of each analyzer. Analyzer responses to these gases were within two (2) percent of the instrument's span or within 0.5 PPM of the gas value. Before and after each test run a sampling system bias check was conducted on each monitor. This check consisted of introducing the calibration gases at the sampling probe thus allowing the gases to travel through the entire sampling system including any filters. The analyzer responses to this check were then recorded by the data acquisition system. All system bias check responses were within five (5) percent of the instruments span or within 0.5 PPM, when compared to the analyzer calibration error check conducted initially. The sampling system bias check conducted prior to each test run was compared to the sampling system bias check conducted at the completion of that same run.

Differences between the two bias checks constitute the upscale and zero calibration drifts. All calculated calibration drifts was below three (3) percent of the span of the analyzer or within 0.5 PPM. Once the initial system bias check is conducted the system was put into the sample mode and data acquisition was initiated. The probe was positioned at the first traverse point. The heated probe was 5/8" stainless steel tube that was traversed at 16.7%, 50.0%, and 83.3% of each respective stack diameter. The following tables show the CEM traverse point locations.

TABLE 4-2
PINETREE BETHLEHEM CEM TRAVERSE POINT LOCATIONS

Traverse Point #	Distance (% Diameter)	Distance (inches) From Inside Surface of Stack
1	16.7	15.0
2	50.0	45.0
3	83.3	75.0

A Thermo Environmental Model 42 NOx/NO2/NO analyzer was used to continuously measure the concentration of NOx in the effluent gas. The analytical technique of the analyzer is chemiluminescence. In the determination of NOx, the sample is routed through a molybdenum converter where the NO2 is disassociated to form NO.

The sample is then passed through a reaction chamber where the NO is quantitatively converted to NO2 by gas phase oxidation with molecular ozone produced within the analyzer. In this reaction, the NO2 molecules are elevated to an electronically excited state, and then immediately reverted to a non-excited ground state. This reversion is accompanied by the emission of photons, which impinge on a photomultiplier detector

4. REFERENCE METHOD TEST PROCEDURES (continued)

and generate a low level DC current. The current is then amplified and used to drive a front panel LED display and data recorder. The NOx concentration measured by the instrument includes the contributions of both the NO in the effluent and the NO resulting from the dissociation of NO2. The efficiency of this converter was checked prior to testing using the procedures specified in Section 8.2.4.1 of this Method.

A STRATA data shuttle documented voltage output from each monitor. This instrument sends all signals via a RS-232 cable to a computer for data archiving. Data points were logged every two (2) seconds during each test run. At the test run completion, data was transferred to a spreadsheet for determination of the raw run average. This data is included in this final report. Results from the initial and final system bias checks was used to adjust the raw run average to correct it for any deviations due to the system bias.

G. Oxygen and Carbon Dioxide - EPA Test Method 3A

Method 3A is used for the determination of Oxygen and Carbon Dioxide emissions from stationary sources using instrumental analyzer procedures. All calibration procedures and requirements for this instrumentation method are identical to those found in EPA Test Method 7E.

O2 content in the effluent was determined by a Teledyne Model 326A monitor which utilizes a micro-fuel cell that consumes O2 from the atmosphere surrounding the measurement probe. The consumption of O2 generates a proportional electrical current. This current is then amplified and provides a signal output of 0-1 V DC which corresponds to a full scale range of 0-25 % O2.

A Fuji Model ZRH non-dispersive infrared analyzer is used to continuously measure the CO2 concentration in the effluent. The theory of operation for this analyzer is based on the principle that CO2 has a unique absorption line spectrum in the infrared region. The instrument consists of an infrared light source, a chopper, a measurement cell, and a detector. The infrared light beam emitted by the source passes through the measuring cell, which is filled with a continuously flowing gas sample. The light beam is partially absorbed or attenuated by the gas species of interest in this cell before reaching the front chamber of the detector.

Both the front and rear chambers of the sealed detector are filled with a reference gas. The difference in the amount of light absorbed between the front and rear chambers are dependent of the concentration of the gas species of interest within the sample measurement cell. A pressure differential is thus created between the two chambers. This pressure difference is then observed as gas flow by the micro-flow sensor located in a channel connecting the two chambers. The resulting AC signal from the micro-flow sensor is rectified, amplified, and linearized into a DC voltage signal for output. An interference response check was conducted on the O2 and CO2 analyzers prior to testing.

H. CEM Stratification Check

Before any reference method test data was taken, a CEM stratification check was conducted to ensure that there is no stratification at the stack test location. Stratification is defined as a difference in excess of 10 percent between the average concentration of the stack and the concentration at any other point. To ensure stratification did not exist, CEMServices conducted a twelve point CEM traverse using the Method 1-2 traverse points in table 4-1.

Each point was sampled for twice the response time of the system. The facility load was used as a reference point to ensure process changes didn't occur during the time needed to conduct the traverse. Once the traverse was completed, each point was compared to the average of all the points. Additional stratification checks were performed on two of the ports at the SCR location. The data here suggests that there is no stratification present and that this is a viable location to perform gaseous stack emission testing (i.e. O2, NOx and CO). Stratification check data can be found in Appendix G.

5. REFERENCE METHOD TEST EQUIPMENT

A. Particulate, Flow and Moisture Sampling Train

All Method 1, 2, and 4 testing, described in Section 4 were conducted using a flow and moisture sampling train. The train, manufactured by Nutech, consists of the following components:

Meter Box - The meter box used in this program was the Nutech Model 2010 - Isokinetic Stack Sampler. This box consists of a leak-free sample pump, a dry gas meter, a vacuum gauge, and temperature readout. Thermocouples are mounted on the inlet and outlet of the dry gas meter to provide meter temperatures during testing.

Umbilical - The umbilical used in this program consisted of a sample line, pitot lines, and thermocouple lines. These lines transport sample from the impingers to the meter box, indicate pressure difference at the pitots to the meter box, and carry temperature signals from the stack to the temperature readout in the meter box.

Heated Sample Line (Jumper) - The heated sample line is ten (10) feet long and transports the gas sample from the end of the probe to the first impinger. This jumper is temperature self regulating and will maintain a temperature of 250 degrees F. This jumper was cleaned and prepared as described in Section 3.

Condenser System - This system consists of four glass impingers placed in series and in an ice bath. The second impinger was of the Greenburg - Smith design, and the first, third, and fourth impinger were standard. When prepared for a test run, the first three impingers were loaded with .1N H2SO4 and the fourth was loaded with a 500 g of silica gel.

Probe - The probe assembly consisted of a set of "S" type pitots, a stack thermocouple, and a stainless steel sheath with a heated quartz glass liner and a Teflon coated steel nozzle. This probe and nozzle were cleaned and prepared as described in Section 3.

Particulate Filter - This in-stack filter was borosilicate glass wool packed in a stainless steel housing.

B. Mobile CEM Laboratory

All reference test methods described in Section 4 was conducted using the CEMServices mobile CEM laboratory. This laboratory consists of all analyzers and support equipment used to conduct the CEM sampling during this test program. The following is a description of each item that makes up the entire system:

Sample Probe - A seven foot heated stainless steel probe was used for this test program. The probe has a filter at the end of it to remove particulate matter. The other end contains a heated three-way "flood chamber" allowing either sample or calibration gas to flow to the sample line.

Particulate Filter - This in-stack filter is a Labyrinth Systems 5 micron sintered stainless steel design.

5. REFERENCE METHOD TEST EQUIPMENT

Calibration Valve Assembly - The calibration valve assembly allows the CEM operator to choose between sample and system calibration. This assembly was capable of blocking and introducing calibration gas into the system without pressurizing it. The two-way valve (on/off) for introducing the calibration gas was located at the base of the probe on the calibration line. This valve was in the off position when not calibrating.

Heated Sample Line (Jumper) - The heated sample line is ten (10) feet long and transports the gas sample from the CEM probe to the moisture removal system. This jumper is temperature self regulating and will maintain a temperature of 250 degrees F.

Moisture Removal System - This system continuously removes moisture from the sample gas while maintaining minimal contact between the condensate and the sample gas. CEMServices uses an ice bath condenser consisting of three (3) stainless steel heat exchangers which are continuously drained of condensate by two (2) peristaltic pumps. The inlet to the system is connected to the heated sample line and the outlet was connected to the sample transport line.

Sample Transport Line - 3/8-inch OD Teflon tubing was used to transport the gas sample from the moisture removal system to the mobile laboratory. Approximately one hundred and fifty (150) feet of tubing was used.

Sample Pump - A dual headed diaphragm pump was used to transport the gas sample through the system to the sample gas manifold. Air Dimension manufactures this pump and all parts coming into contact with the gas stream are either Teflon or stainless steel.

Sample Gas Manifold - This manifold consists of a series of valves and adjustable rotameters capable of setting and maintaining the desired backpressure and flow rate to the analyzers during both sampling and calibration.

Sample Gas Analyzers - CEMServices used the following analyzers to complete this test program:

TABLE 5-1
REFERENCE METHOD ANALYZERS

Gas	Manufacturer	Model	Serial #	Range
O_2	California Analytical	O2	4E04002	0-22.7 %
CO_2	California Analytical	ZRH	N5B0872T	0-19.77 %
NOx	Thermo Electron	42	42H-43816-270	0-191.1 PPM

Data Recorder - All voltage outputs from the analyzers are sent to a Strawberry Tree Data Shuttle. This shuttle will log data at two-second intervals. Data from the shuttle is sent to a computer where a Strawberry Tree data acquisition program lists instantaneous concentration values for each parameter. At the conclusion of each run, one-minute averages are printed out and a calibration is initiated through the program. The calibration data is used to correct the raw averages for system bias and drift.

5. REFERENCE METHOD TEST EQUIPMENT

C. Calibration Gases

All calibration gases to be used in this test program were prepared according to EPA Protocol G1/G2. As per EPA Test Method 7E for all O2 and NOx testing, the high level calibration gas was the span of the analyzer. All mid calibration gas values were between 40-60 % of the span of the analyzer (or value of the high level gas), and all low calibration gas values were between 0-20 % of the span of the analyzer (or value of the high level gas). The zero calibrations for all analyzers were conducted using pre-purified grade Nitrogen.

TABLE 5-2
REFERENCE METHOD CALIBRATION GASES

MONITOR SPAN	ALLOWABLE GAS VALUES	CAL POINT	ACTUAL VALUE	CYLINDER #	EXPIRATION DATE
O2 0-22.7 %	0.0-4.5	Low	-	-	-
	9.1-13.6	Mid	11.38	CC68413	11/1/10
	22.7	High	22.7	CC113859	6/19/10
CO2 0-19.77 %	0.0-3.9	Low	-	-	-
	7.9-11.9	Mid	9.93	CC68413	11/1/10
	19.77	High	19.77	CC113859	6/19/10
NOx 0-191.1 PPM	0.0-38.2	Low	-	-	-
	76.4-114.7	Mid	96.3	CC133593	11/26/09
	191.1	High	191	CC88433	05/02/09

6. QUALITY CONTROL PROCEDURES

A. General

Throughout all phases of this test program strict attention was given to all testing to provide the highest quality of results possible. All of CEMServices test equipment is of the highest quality available and undergoes routine maintenance to ensure top operating condition. This includes meter boxes, thermocouples, barometers, pitot tubes and sampling nozzles.

Meter boxes are calibrated over a full range of flow rates against certified orifices every six months. After each field use the meter box is given a calibration check against an orifice at the average flow rates and highest vacuums experienced in the field. Thermocouples are calibrated as specified in the EPA Handbook against NBS traceable mercury in glass thermometer. Pitot tubes are visually inspected for conformance to the dimensional specified in EPA Method 2.

Sampling was conducted by trained personnel with extensive experience in CEM sampling. All analyzers are tested for interference of other gas compounds at least once every six months. In addition, a converter efficiency check is performed on the NOx analyzer to ensure the proper conversion of NO2 to NO.

All sampling and analysis was conducted in strict accordance with EPA test procedures (where available). The quality control procedures found in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems was adhered to as well.

Analyzer calibrations were performed at the beginning of each test day. System calibrations were performed before and after each test run through the entire sampling system. All calculations were conducted in strict accordance with the equations found in the individual Methods. Calculations were conducted on a computer and the input data was checked by a person other than the original calculator to ensure that it is correct.

The entire staff of CEMServices is thoroughly familiar with all test methods used in this program and has extensive experience in source emission monitoring.

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DEFINITION OF ABBREVIATIONS

ACFM	Flowrate reported in actual cubic feet per minute.
An	Area of the nozzle, cross-sectional, in square feet.
As	Area of the stack in square feet.
BWO	Water vapor in gas stream, proportional by volume.
CC	Percent error confidence coefficient (one tailed).
Cd	Conversion calibration for concentration (PPMdv to lbs/SCF)
Cgas	Final emissions data reported by CEMS, adjusted for calibration drift. Reported as ppm dry, proportional by volume.
Cm	Average CEM response to initial and final span gas system calibration.
Cma	Concentration of the calibration gases.
Co	Average CEM response to initial and final zero gas system calibration.
Craw	Raw emissions data reported by the CEMS, uncorrected for calibration drift.
Cwet	Final emissions data reported by CEMS, adjusted for calibration drift and water vapor. Reported as ppm wet, proportional by volume.
% CO	Percent of carbon monoxide in the flue gas.
% CO_2	Percent of carbon dioxide in the flue gas.
Cp	Pitot tube coefficient.
Cs	The concentration in the stack in pounds per standard cubic foot.
Cs'	The concentration in the stack in grains per standard cubic foot.
Cs' @ 12%	The concentration in the stack in grains per dry standard cubic feet corrected to 12% CO_2.
DELTA H	The pressure differential across orifice meter, reported in inches of H_2O.
DELTA H(ABS)	The pressure differential across orifice meter, absolute conditions in inches of mercury.
Dn (IN)	Diameter of the nozzle in inches.
DGM IN	Temperature of the dry gas meter inlet, reported in degrees Fahrenheit.
DGM OUT	Temperature of the dry gas meter outlet, reported in degrees Fahrenheit.
Ds (FT)	Diameter of the stack in feet.
DSCFH	Dry standard cubic feet per hour.
DSCFM	Dry standard cubic feet per minute.
DSCMH	Dry standard cubic meters per hour.
E	Emission rate in pounds per million Btu using F Factor of fuel burned.
END METER	The dry gas meter reading at the end of the test.
F FACTOR	The theoretical amount of air in dry standard cubic feet (DSCF) needed to combust a million Btu's worth of fuel.
GR/BHP-HR	Grams per brake horsepower hour.
IMP(FIN)	Final volume of absorbing solution in impinger.
IMP(INT)	Initial volume of absorbing solution in impinger.
INT METER	The dry gas meter reading at the beginning of the test.
% ISO	Variation of sampling from isokinetic conditions.
LB/HR	Pounds per hour.
LB/MMBTU	Pounds per million British Thermal Unit.
LB/SCF	Pounds per standard cubic foot.
Md (DRY)	The dry molecular weight of the flue gas in pounds per pound mole.
MI	Volume in milliliters.
Mg/M3	Milligrams per cubic meter.
Mn	Total particulate found in sample minus the acetone residue (blank). Reported in milligrams.
Ms (WET)	Wet or actual molecular weight of the flue gas in pounds per pound mole.
MW	Molecular weight
% N2	The percent of nitrogen in the flue gas.
NO. PTS	Number of traverse points.
% O2	% oxygen in the flue gas.
P BAR	Barometric pressure at test location.
PIT COEFF	Pitot tube coefficient (S Type=.84, standard=.99).
PPM	Parts per million.

DEFINITION OF ABBREVIATIONS

PPMdv	Parts per million - dry volume.
PPMwv	Parts per million - wet volume.
P STK	Static pressure of the stack in inches of water.
PMR	The pollutant mass rate in pounds per hour.
PS (ABS)	Absolute stack pressure in inches of mercury.
Pstd	Standard absolute pressure, (29.92 in. Hg).
Qs	The volumetric flow rate of the flue gas in dry standard cubic feet per hour.
RA	Relative accuracy.
RATA	Relative accuracy test audit.
RM	Reference Method.
Sd	Emission standard (allowable emission rate).
SQ ROOT	The square root of each velocity head measurement (Delta P).
SQRT DELTA P	The average of the square roots of the measured pressure drops.
Stack Temp	The temperature of the stack in degrees (°F) Fahrenheit.
TM (°F)	Average temperature of the dry gas meter in degrees Fahrenheit.
TM (°R)	Average temperature of the dry gas meter in degrees Rankine.
TS (°R)	The temperature of the stack in degrees Rankine.
VEL HEAD	The pressure drop measured across the pitot tubes.
VI (TOT)	The amount of water collected in the impingers in milliliters.
VM (CF)	The volume sampled through the dry gas meter in cubic feet.
VM STD	Volume sampled through the dry gas meter corrected to standard conditions.
VOC	Volatile organic compounds
VS	Velocity of the stack gas in feet per second.
VW STD	The amount of moisture collected, corrected to standard conditions.
Y	Dry gas meter calibration factor.

RELATIVE ACCURACY CALCULATION SHEET O2 % wv EMISSIONS

PLANT: PINETREE BETHLEHEM
LOCATION: STACK
TEST DATE: 3/28/08
PARAMETER: O2
UNITS: % wv

RUN NAME									
RUN #	1	2	3	4	5	6	7	8	9
RM DATA	3.97	4.65	4.21	4.20	3.94	3.94	3.92	3.60	3.76
PLANT DATA	4.07	4.85	4.33	4.32	4.02	4.05	4.00	3.63	3.81
DIFFERENCE	-0.10	-0.20	-0.12	-0.12	-0.08	-0.11	-0.08	-0.03	-0.05
DIFF SQRD	1E-02	4E-02	1E-02	1E-02	6E-03	1E-02	7E-03	1E-03	3E-03

D = ARITH. MEAN -0.09904

SUM DIFF -0.891

(SUM DIF)SQRD 0.7946

SUM(DIF SQRD) 1.07E-01

N = NUMBER OF RUNS 9

Sd = STANDARD DEV. 0.049

T.975 = T VALUE 2.306

CC = T.975 * Sd / SQRT(N)

CC = CONFIDENCE COE 0.0373
PLANT AVERAGE = 4.12 % wv
RM = AVG RM DATA 4.02 % wv
ABSOLUTE DIFF. = 0.10 % wv
RA = (ABS(D)+ABS(CC)) / RM * 100

Sd = STANDARD = NA

RA = REL ACCURACY = 3.4 % (ALLOWED 20%)

RELATIVE ACCURACY CALCULATION SHEET- NOx LB/MMBTU EMISSIONS

PLANT: PINETREE BETHLEHEM
LOCATION: STACK
TEST DATE: 3/28/08
PARAMETER: NOx
UNITS: LB/MMBTU

	RUN NAME									
	RUN #	1	2	3	4	5	6	7	8	9
	RM DATA	0.064	0.072	0.075	0.066	0.053	0.053	0.031	0.020	0.028
	PLANT DATA	0.065	0.073	0.077	0.066	0.056	0.057	0.033	0.021	0.030
	DIFFERENCE	-0.001	-0.001	-0.002	0.000	-0.003	-0.004	-0.002	-0.001	-0.002
	DIFF SQRD	6.8E-07	9.5E-07	4.2E-06	1.5E-07	8.1E-06	1.3E-05	3.9E-06	1.3E-06	2.9E-06
D =	ARITH. MEAN	-0.00165								
	SUM DIFF	-0.015								
	(SUM DIF)SQRD	0.0002								
	SUM(DIF SQRD)	3.57E-05								
N =	NUMBER OF RUNS	9								
Sd =	STANDARD DEV.	0.001								
T.975 =	T VALUE	2.306								

CC = T.975 * Sd / SQRT(N)

CC = CONFIDENCE COE 0.0009
PLANT AVERAGE = 0.053 LB/MMBTU
RM = AVG RM DATA 0.051 LB/MMBTU
ABSOLUTE DIFF. = 0.002 LB/MMBTU
RA = (ABS(D)+ABS(CC)) / RM * 100

Sd = STANDARD = NA

RA = REL ACCURACY = 5.0 % (ALLOWED 20%)

RELATIVE ACCURACY CALCULATION SHEET- NOx LB/HR EMISSIONS

PLANT: PINETREE BETHLEHEM
LOCATION: STACK
TEST DATE: 3/28/08
PARAMETER: NOx
UNITS: LB/HR

	RUN NAME									
	RUN #	1	2	3	4	5	6	7	8	9
	RM DATA	20.15	21.40	23.08	20.35	16.63	16.69	9.62	6.32	8.89
	PLANT DATA	19.58	19.55	21.49	19.13	15.95	16.02	9.75	6.32	8.81
	DIFFERENCE	0.57	1.85	1.59	1.22	0.68	0.67	-0.13	0.00	0.08
	DIFF SQRD	3.3E-01	3.4E+00	2.5E+00	1.5E+00	4.6E-01	4.4E-01	1.6E-02	5.0E-06	6.3E-03
D =	ARITH. MEAN	0.72464								
	SUM DIFF	6.522								
	(SUM DIF)SQRD	42.53								
	SUM(DIF SQRD)	8.68E+00								
N =	NUMBER OF RUNS	9								
Sd =	STANDARD DEV.	0.703								
T.975 =	T VALUE	2.306								

CC = T.975 * Sd / SQRT(N)

CC =	CONFIDENCE COE	0.5406	
PLANT AVERAGE =		15.18	LB/HR
RM =	AVG RM DATA	15.90	LB/HR
ABSOLUTE DIFF. =		0.72	LB/HR

RA = (ABS(D)+ABS(CC)) / RM * 100

Sd = STANDARD = NA

RA = REL ACCURACY = 8.0 % (ALLOWED 20%)

VELOCITY TRAVERSE DATA AND PARTICULATE EMISSION CALCULATIONS

FACILITY: PINETREE BETHLEHEM
UNIT : WOOD FIRED BOILER
DATE : 03-28-08

RUN ID# : 1
START TIME: 09:00
END TIME: 10:10

		TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
Ds (FT)	7.50	A1	0.50	0.71	1.15	52	50	418
As (SQFT)	44.18	2	0.51	0.71	1.17	52	49	432
Y =	1.022	3	0.49	0.70	1.13	52	48	431
PIT COEFF	0.84	4	0.52	0.72	1.20	53	48	431
Dn (IN)	0.275	5	0.52	0.72	1.20	53	48	422
An (SQFT)	0.00041	6	0.51	0.71	1.17	53	47	421
IMP-1 (INT)	100	B1	0.48	0.69	1.10	52	47	429
IMP-2 (INT)	100	2	0.48	0.69	1.10	52	47	428
IMP-3 (INT)	0	3	0.47	0.69	1.08	53	47	427
IMP-4 (INT)	550	4	0.50	0.71	1.15	54	48	417
IMP-1 (FIN)	308	5	0.52	0.72	1.20	54	47	420
IMP-2 (FIN)	104	6	0.51	0.71	1.17	54	48	390
IMP-3 (FIN)	4							
IMP-4 (FIN)	557.3							
% CO2 (OUT)	15.10							
% O2 (OUT)	5.50							
% CO (OUT)	0.00							
% N2 (OUT)	79.40							

P BAR	29.1						
PSTK	-1.00						
FINAL METER	940.055						
INT METER	903.333						
VM (CF)	36.722	AVG:	0.50	0.71	1.15	52.83	47.83	422.17
RUN TIME	60	TS ('R)=		882.2	DELTA H (ABS) =			29.18
F-FACTOR	9240	TM ('F)=		50.3	PS (ABS) =			29.03
		TM ('R)=		510.3	VI (TOT) =			223.3

SAMPLE	FILTER	BEAKER	SAMPLE	FILTER	BEAKER
NUMBER	3166	1	NUMBER	3173	7
FINAL WT.	0.3834	65.9522	FINAL WT.	0.3640	65.1301
TARE WT.	0.3608	65.9456	TARE WT.	0.3639	65.1297
NET WT.	0.0226	0.0066	NET WT.	0.0001	0.0004

SAMPLE BEAKER VOLUME 88 ml
BLANK BEAKER VOLUME 100 ml
TOTAL SAMPLE GAIN 29.20 mg
ACETONE RESIDUE 0.35 mg
TOTAL SAMPLE GAIN LESS ACETONE RESIDUE (Mn) = 28.85 mg

VM STD	= 17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.86	DSCF
VW STD	= .04707 (VI TOT)	=	10.51	CF
BWO	= (VW STD)/(VW STD)+(VM STD)	=	0.217	
Md (DRY)	= .44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.64	LBS/MOLE
Ms (WET)	= Md(1-BWO)+18(BWO)	=	27.89	LBS/MOLE
G	= SQRT (TS / PS / MS)	=	1.04	
VS	= 85.49(CP)(G)(SQRT DELTA P)	=	53.04	FPS
H	= 0.002669 (VI TOT)	=	0.60	
J	= (DELTA H ABS) (VM) (Y) / (TM)	=	2.15	
K	= (H) + (J)	=	2.74	
% ISO	= ((TS)(K)(1.667))/ ((TIME)(VS)(PS)(AN))	=	105.8	%
Qs	= 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3832549	DSCFH
CS	= (2.205x10-6) (MN) / (VM STD)	=	1.680E-06	LBS/SCF
CS'	= .0154 (MN) / (VM STD)	=	0.01173	GRAINS/SCF
CS'@7%O2	= CS' * (20.9-7) / (20.9 - O2)	=	0.01059	GRAINS/SCF
CS'@7%O2=	(mg / (Vmstd * 0.02832)) * (20.9-7) / (2	=	24.29	mg/DSCM
PMR	= CS X Qs	=	6.44	LBS/HR
E	= CS x FUEL FACTOR X(20.9/(20.9-%O2))	=	0.021	LBS/MMBTU

VELOCITY TRAVERSE DATA AND PARTICULATE EMISSION CALCULATIONS

FACILITY: PINETREE BETHLEHEM
UNIT : WOOD FIRED BOILER
DATE : 03-28-08

RUN ID# : 2
START TIME: 10:40
END TIME: 11:55

		TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
Ds (FT)	7.50	B1	0.50	0.71	1.15	49	45	426
As (SQFT)	44.18	2	0.52	0.72	1.20	52	46	425
Y =	1.022	3	0.49	0.70	1.13	54	47	426
PIT COEFF	0.84	4	0.52	0.72	1.20	55	48	425
Dn (IN)	0.275	5	0.52	0.72	1.20	55	49	419
An (SQFT)	0.00041	6	0.50	0.71	1.15	55	48	418
IMP-1 (INT)	100	A1	0.47	0.69	1.08	53	48	424
IMP-2 (INT)	100	2	0.47	0.69	1.08	55	48	423
IMP-3 (INT)	0	3	0.49	0.70	1.13	56	49	424
IMP-4 (INT)	550	4	0.53	0.73	1.22	57	50	417
IMP-1 (FIN)	308	5	0.54	0.73	1.24	57	50	416
IMP-2 (FIN)	110	6	0.53	0.73	1.22	58	51	417
IMP-3 (FIN)	4							
IMP-4 (FIN)	558.5							
% CO2 (OUT)	15.30							
% O2 (OUT)	5.20							
% CO (OUT)	0.00							
% N2 (OUT)	79.50							

P BAR	29.1						
PSTK	-1.00						
FINAL METER	976.555						
INT METER	940.286						
VM (CF)	36.269	AVG:	0.51	0.71	1.17	54.67	48.25	421.67
RUN TIME	60	TS ('R)=		881.7	DELTA H (ABS)	=		29.19
F-FACTOR	9240	TM ('F)=		51.5	PS (ABS)	=		29.03
		TM ('R)=		511.5	VI (TOT)	=		230.5

SAMPLE	FILTER	BEAKER	SAMPLE	FILTER	BEAKER
NUMBER	3167	2	NUMBER	3173	7
FINAL WT.	0.3830	62.5578	FINAL WT.	0.3640	65.1301
TARE WT.	0.3622	62.5552	TARE WT.	0.3639	65.1297
NET WT.	0.0208	0.0026	NET WT.	0.0001	0.0004

SAMPLE BEAKER VOLUME	80 ml	BLANK BEAKER VOLUME	100	ml
TOTAL SAMPLE GAIN	23.40 mg	ACETONE RESIDUE	0.32	mg
TOTAL SAMPLE GAIN LESS ACETONE RESIDUE (Mn)		=	23.08	mg

VM STD	= 17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.31	DSCF
VW STD	= .04707 (VI TOT)	=	10.85	CF
BWO	= (VW STD)/(VW STD)+(VM STD)	=	0.225	
Md (DRY)	= .44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.66	LBS/MOLE
Ms (WET)	= Md(1-BWO)+18(BWO)	=	27.80	LBS/MOLE
G	= SQRT (TS / PS / MS)	=	1.05	
VS	= 85.49(CP)(G)(SQRT DELTA P)	=	53.41	FPS
H	= 0.002669 (VI TOT)	=	0.62	
J	= (DELTA H ABS) (VM) (Y) / (TM)	=	2.12	
K	= (H) + (J)	=	2.73	
% ISO	= ((TS)(K)(1.667))/ ((TIME)(VS)(PS)(AN))	=	104.6	%

Qs	= 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3822014	DSCFH
CS	= (2.205x10-6) (MN) / (VM STD)	=	1.36E-06	LBS/SCF
CS'	= .0154 (MN) / (VM STD)	=	0.00953	GRAINS/SCF
CS'@7%O2	= CS' * (20.9-7) / (20.9 - O2)	=	0.0084	GRAINS/SCF
CS'@7%O2=	(mg / (Vmstd * 0.02832)) * (20.9-7) / (2(	=	19.338	mg/DSCM
PMR	= CS X Qs	=	5.21	LBS/HR
E	= CS x FUEL FACTOR X(20.9/(20.9-%O2))	=	0.017	LBS/MMBTU

VELOCITY TRAVERSE DATA AND PARTICULATE EMISSION CALCULATIONS

FACILITY:	PINETREE BETHLEHEM						RUN ID# :	3
UNIT :	WOOD FIRED BOILER						START TIME:	12:15
DATE :	03-28-08						END TIME:	13:25
		TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
Ds (FT)	7.50	A1	0.49	0.70	1.13	57	52	425
As (SQFT)	44.18	2	0.51	0.71	1.17	58	52	423
Y =	1.0220	3	0.53	0.73	1.22	59	52	424
PIT COEFF	0.84	4	0.53	0.73	1.22	60	53	423
Dn (IN)	0.275	5	0.54	0.73	1.24	62	53	415
An (SQFT)	0.00041	6	0.51	0.71	1.17	62	54	416
IMP-1 (INT)	100	B1	0.48	0.69	1.10	62	55	419
IMP-2 (INT)	100	2	0.50	0.71	1.15	64	56	419
IMP-3 (INT)	0	3	0.50	0.71	1.15	66	57	418
IMP-4 (INT)	550	4	0.54	0.73	1.24	67	58	420
IMP-1 (FIN)	330	5	0.53	0.73	1.22	68	58	412
IMP-2 (FIN)	106	6	0.49	0.70	1.13	69	59	412
IMP-3 (FIN)	2							
IMP-4 (FIN)	558.0							
% CO2 (OUT)	15.40							
% O2 (OUT)	4.90							
% CO (OUT)	0.00							
% N2 (OUT)	79.70							

P BAR	29.1							
PSTK	-1.00							
FINAL METER	1013.323							
INT METER	976.704							
VM (CF)	36.619	AVG:	0.51	0.72	1.18	62.83	54.92	418.83
RUN TIME	60	TS ('R) =		878.8	DELTA H (ABS) =			29.19
F-FACTOR	9240	TM ('F) =		58.9	PS (ABS) =			29.03
		TM ('R) =		518.9	VI (TOT) =			246.0

SAMPLE	FILTER	BEAKER	SAMPLE	FILTER	BEAKER
NUMBER	3168	6	NUMBER	3173	7
FINAL WT.	0.3730	71.4282	FINAL WT.	0.3640	65.1301
TARE WT.	0.3633	71.4261	TARE WT.	0.3639	65.1297
NET WT.	0.0097	0.0021	NET WT.	0.0001	0.0004

SAMPLE BEAKER VOLUME	75 ml	BLANK BEAKER VOLUME	100	ml
TOTAL SAMPLE GAIN	11.80 mg	ACETONE RESIDUE	0.30	mg
TOTAL SAMPLE GAIN LESS ACETONE RESIDUE (Mn)		=	11.50	mg

VM STD	= 17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.13	DSCF
VW STD	= .04707 (VI TOT)	=	11.58	CF
BWO	= (VW STD)/(VW STD)+(VM STD)	=	0.238	
Md (DRY)	= .44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.66	LBS/MOLE
Ms (WET)	= Md(1-BWO)+18(BWO)	=	27.65	LBS/MOLE
G	= SQRT (TS / PS / MS)	=	1.05	
VS	= 85.49(CP)(G)(SQRT DELTA P)	=	53.78	FPS
H	= 0.002669 (VI TOT)	=	0.66	
J	= (DELTA H ABS) (VM) (Y) / (TM)	=	2.11	
K	= (H) + (J)	=	2.76	
% ISO	= ((TS)(K)(1.667))/ ((TIME)(VS)(PS)(AN))	=	104.7	%
Qs	= 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3799170	DSCFH
CS	= (2.205x10-6) (MN) / (VM STD)	=	6.829E-07	LBS/SCF
CS'	= .0154 (MN) / (VM STD)	=	0.0048	GRAINS/SCF
CS'@7%O2	= CS' * (20.9-7) / (20.9 - O2)	=	0.0041	GRAINS/SCF
CS'@7%O2=	(mg / (Vmstd * 0.02832)) * (20.9-7) / (20.9	=	9.50	mg/DSCM
PMR	= CS X Qs	=	2.59	LBS/HR
E	= CS x FUEL FACTOR X(20.9/(20.9-%O2))	=	0.008	LBS/MMBTU

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 1
START TIME: 9:00
END TIME: 9:21

Ds (FT)	7.50
As (SQFT)	44.18
Y =	1.0220
PIT COEFF	0.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	550
IMP-1 (FIN)	308
IMP-2 (FIN)	104
IMP-3 (FIN)	4
IMP-4 (FIN)	557.3
% CO2 (OUT)	15.47
% O2 (OUT)	5.07
% CO (OUT)	0.09
% N2 (OUT)	79.37
P BAR	29.10
PSTK	-1.00
FINAL METER	940.055
INT METER	903.333
MID CHECK	0.000
VM (CF) =	36.722

TRAV PT.	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
A1	0.50	0.71	1.15	52	50	418
2	0.51	0.71	1.17	52	49	432
3	0.49	0.70	1.13	52	48	431
4	0.52	0.72	1.20	53	48	431
5	0.52	0.72	1.20	53	48	422
6	0.51	0.71	1.17	53	47	421
B1	0.48	0.69	1.10	52	47	429
2	0.48	0.69	1.10	52	47	428
3	0.47	0.69	1.08	53	47	427
4	0.50	0.71	1.15	54	48	417
5	0.52	0.72	1.20	54	47	420
6	0.51	0.71	1.17	54	48	390
AVG:	0.50	0.71	1.15	52.8	47.8	422.2

TS ('R) =	882.2	DELTA H (ABS) =	29.18
TM ('F) =	50.3	PS (ABS) =	29.03
TM ('R) =	510.3	VI (TOT) =	223.3

VM STD	=	17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.86	DSCF
VW STD	=	.04707 (VI TOT)	=	10.51	CF
BWO	=	(VW STD)/(VW STD)+(VM STD)	=	0.217	
1-BWO	=	1 - BWO	=	0.783	
Md (DRY)	=	.44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.68	LBS/LB
Ms (WET)	=	Md(1-BWO)+18(BWO)	=	27.92	LBS/LB
G	=	SQRT (TS / PS / MS)	=	1.04	
VS	=	85.49(CP)(G)(SQRT DELTA P)	=	53.01	FPS
Qs	=	3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3830292	DSCFH
				63838	DSCFM
				140521	ACFM
				81561	WSCFM

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 2
START TIME: 9:28
END TIME: 9:49

Ds (FT)	7.50
As (SQFT)	44.18
Y =	1.0220
PIT COEFF	0.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	550
IMP-1 (FIN)	308
IMP-2 (FIN)	104
IMP-3 (FIN)	4
IMP-4 (FIN)	557.3
% CO2 (OUT)	14.69
% O2 (OUT)	5.94
% CO (OUT)	0.08
% N2 (OUT)	79.29
P BAR	29.10
PSTK	-1.00
FINAL METER	940.055
INT METER	903.333
MID CHECK	0.000
VM (CF) =	36.722

TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
A1	0.50	0.71	1.15	52	50	418
2	0.51	0.71	1.17	52	49	432
3	0.49	0.70	1.13	52	48	431
4	0.52	0.72	1.20	53	48	431
5	0.52	0.72	1.20	53	48	422
6	0.51	0.71	1.17	53	47	421
B1	0.48	0.69	1.10	52	47	429
2	0.48	0.69	1.10	52	47	428
3	0.47	0.69	1.08	53	47	427
4	0.50	0.71	1.15	54	48	417
5	0.52	0.72	1.20	54	47	420
6	0.51	0.71	1.17	54	48	390
AVG:	0.50	0.71	1.15	52.8	47.8	422.2

TS ('R) = 882.2
TM ('F) = 50.3
TM ('R) = 510.3

DELTA H (ABS) = 29.18
PS (ABS) = 29.03
VI (TOT) = 223.3

VM STD = 17.64 (VM) (Y) (DELTA H ABS) / (TM) = 37.86 DSCF

VW STD = .04707 (VI TOT) = 10.51 CF

BWO = (VW STD)/(VW STD)+(VM STD) = 0.217

1-BWO = 1 - BWO = 0.783

Md (DRY) = .44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2) = 30.59 LBS/LB

Ms (WET) = Md(1-BWO)+18(BWO) = 27.85 LBS/LB

G = SQRT (TS / PS / MS) = 1.04

VS = 85.49(CP)(G)(SQRT DELTA P) = 53.08 FPS

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 3835133 DSCFH
63919 DSCFM
140699 ACFM
81664 WSCFM

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 3
START TIME: 09:55
END TIME: 10:16

Ds (FT)	7.50
As (SQFT)	44.18
Y =	1.0220
PIT COEFF	0.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	550
IMP-1 (FIN)	308
IMP-2 (FIN)	104
IMP-3 (FIN)	4
IMP-4 (FIN)	557.3
% CO2 (OUT)	15.11
% O2 (OUT)	5.38
% CO (OUT)	0.10
% N2 (OUT)	79.41
P BAR	29.10
PSTK	-1.00
FINAL METER	940.055
INT METER	903.333
MID CHECK	0.000
VM (CF) =	36.722

TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
A1	0.50	0.71	1.15	52	50	418
2	0.51	0.71	1.17	52	49	432
3	0.49	0.70	1.13	52	48	431
4	0.52	0.72	1.20	53	48	431
5	0.52	0.72	1.20	53	48	422
6	0.51	0.71	1.17	53	47	421
B1	0.48	0.69	1.10	52	47	429
2	0.48	0.69	1.10	52	47	428
3	0.47	0.69	1.08	53	47	427
4	0.50	0.71	1.15	54	48	417
5	0.52	0.72	1.20	54	47	420
6	0.51	0.71	1.17	54	48	390
AVG:	0.50	0.71	1.15	52.8	47.8	422.2

TS ('R) =	882.2	DELTA H (ABS) =	29.18
TM ('F) =	50.3	PS (ABS) =	29.03
TM ('R) =	510.3	VI (TOT) =	223.3

VM STD	=	17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.86 DSCF
VW STD	=	.04707 (VI TOT)	=	10.51 CF
BWO	=	(VW STD)/(VW STD)+(VM STD)	=	0.217
1-BWO	=	1 - BWO	=	0.783
Md (DRY)	=	.44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.63 LBS/LB
Ms (WET)	=	Md(1-BWO)+18(BWO)	=	27.89 LBS/LB
G	=	SQRT (TS / PS / MS)	=	1.04
VS	=	85.49(CP)(G)(SQRT DELTA P)	=	53.05 FPS
Qs	=	3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3832721 DSCFH
				63879 DSCFM
				140610 ACFM
				81613 WSCFM

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 4
START TIME: 10:30
END TIME: 10:51

Ds (FT)	7.50
As (SQFT)	44.18
Y =	1.0220
PIT COEFF	0.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	550
IMP-1 (FIN)	308
IMP-2 (FIN)	110
IMP-3 (FIN)	4
IMP-4 (FIN)	558.5
% CO2 (OUT)	15.06
% O2 (OUT)	5.42
% CO (OUT)	0.09
% N2 (OUT)	79.43
P BAR	29.10
PSTK	-1.00
FINAL METER	976.555
INT METER	940.286
MID CHECK	0.000
VM (CF) =	36.269

TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
B1	0.50	0.71	1.15	49	45	426
2	0.52	0.72	1.20	52	46	425
3	0.49	0.70	1.13	54	47	426
4	0.52	0.72	1.20	55	48	425
5	0.52	0.72	1.20	55	49	419
6	0.50	0.71	1.15	55	48	418
A1	0.47	0.69	1.08	53	48	424
2	0.47	0.69	1.08	55	48	423
3	0.49	0.70	1.13	56	49	424
4	0.53	0.73	1.22	57	50	417
5	0.54	0.73	1.24	57	50	416
6	0.53	0.73	1.22	58	51	417
AVG:	0.51	0.71	1.17	54.7	48.3	421.7

TS ('R) =	881.7	DELTA H (ABS) =	29.19
TM ('F) =	51.5	PS (ABS) =	29.03
TM ('R) =	511.5	VI (TOT) =	230.5

VM STD	=	17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.31	DSCF
VW STD	=	.04707 (VI TOT)	=	10.85	CF
BWO	=	(VW STD)/(VW STD)+(VM STD)	=	0.225	
1-BWO	=	1 - BWO	=	0.775	
Md (DRY)	=	.44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.63	LBS/LB
Ms (WET)	=	Md(1-BWO)+18(BWO)	=	27.78	LBS/LB
G	=	SQRT (TS / PS / MS)	=	1.05	
VS	=	85.49(CP)(G)(SQRT DELTA P)	=	53.43	FPS
Qs	=	3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3823591	DSCFH
				63727	DSCFM
				141640	ACFM
				82257	WSCFM

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 5
START TIME: 10:59
END TIME: 11:20

Ds (FT)	7.50
As (SQFT)	44.18
Y =	1.0220
PIT COEFF	0.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	550
IMP-1 (FIN)	308
IMP-2 (FIN)	110
IMP-3 (FIN)	4
IMP-4 (FIN)	558.5
% CO2 (OUT)	15.42
% O2 (OUT)	5.09
% CO (OUT)	0.10
% N2 (OUT)	79.39
P BAR	29.10
PSTK	-1.00
FINAL METER	976.555
INT METER	940.286
MID CHECK	0.000
VM (CF) =	36.269

TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
B1	0.50	0.71	1.15	49	45	426
2	0.52	0.72	1.20	52	46	425
3	0.49	0.70	1.13	54	47	426
4	0.52	0.72	1.20	55	48	425
5	0.52	0.72	1.20	55	49	419
6	0.50	0.71	1.15	55	48	418
A1	0.47	0.69	1.08	53	48	424
2	0.47	0.69	1.08	55	48	423
3	0.49	0.70	1.13	56	49	424
4	0.53	0.73	1.22	57	50	417
5	0.54	0.73	1.24	57	50	416
6	0.53	0.73	1.22	58	51	417
AVG:	0.51	0.71	1.17	54.7	48.3	421.7

TS ('R) = 881.7
TM ('F) = 51.5
TM ('R) = 511.5
DELTA H (ABS) = 29.19
PS (ABS) = 29.03
VI (TOT) = 230.5

VM STD	= 17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.31	DSCF
VW STD	= .04707 (VI TOT)	=	10.85	CF
BWO	= (VW STD)/(VW STD)+(VM STD)	=	0.225	
1-BWO	= 1 - BWO	=	0.775	
Md (DRY)	= .44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.67	LBS/LB
Ms (WET)	= Md(1-BWO)+18(BWO)	=	27.82	LBS/LB
G	= SQRT (TS / PS / MS)	=	1.04	
VS	= 85.49(CP)(G)(SQRT DELTA P)	=	53.40	FPS
Qs	= 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3821226	DSCFH
			63687	DSCFM
			141552	ACFM
			82206	WSCFM

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 6
START TIME: 11:27
END TIME: 11:48

Ds (FT)	7.50
As (SQFT)	44.18
Y =	1.0220
PIT COEFF	0.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	550
IMP-1 (FIN)	308
IMP-2 (FIN)	110
IMP-3 (FIN)	4
IMP-4 (FIN)	558.5
% CO2 (OUT)	15.41
% O2 (OUT)	5.09
% CO (OUT)	0.10
% N2 (OUT)	79.40
P BAR	29.10
PSTK	-1.00
FINAL METER	976.555
INT METER	940.286
MID CHECK	0.000
VM (CF) =	36.269

TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
B1	0.50	0.71	1.15	49	45	426
2	0.52	0.72	1.20	52	46	425
3	0.49	0.70	1.13	54	47	426
4	0.52	0.72	1.20	55	48	425
5	0.52	0.72	1.20	55	49	419
6	0.50	0.71	1.15	55	48	418
A1	0.47	0.69	1.08	53	48	424
2	0.47	0.69	1.08	55	48	423
3	0.49	0.70	1.13	56	49	424
4	0.53	0.73	1.22	57	50	417
5	0.54	0.73	1.24	57	50	416
6	0.53	0.73	1.22	58	51	417
AVG:	0.51	0.71	1.17	54.7	48.3	421.7

TS ('R)= 881.7 DELTA H (ABS) = 29.19
TM ('F)= 51.5 PS (ABS) = 29.03
TM ('R)= 511.5 VI (TOT) = 230.5

VM STD	= 17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.31	DSCF
VW STD	= .04707 (VI TOT)	=	10.85	CF
BWO	= (VW STD)/(VW STD)+(VM STD)	=	0.225	
1-BWO	= 1 - BWO	=	0.775	
Md (DRY)	= .44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.67	LBS/LB
Ms (WET)	= Md(1-BWO)+18(BWO)	=	27.82	LBS/LB
G	= SQRT (TS / PS / MS)	=	1.04	
VS	= 85.49(CP)(G)(SQRT DELTA P)	=	53.40	FPS
Qs	= 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3821311	DSCFH
			63689	DSCFM
			141555	ACFM
			82208	WSCFM

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 7
START TIME: 12:00
END TIME: 12:21

Ds (FT)	7.50
As (SQFT)	44.18
Y =	1.0220
PIT COEFF	0.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	550
IMP-1 (FIN)	330
IMP-2 (FIN)	106
IMP-3 (FIN)	2
IMP-4 (FIN)	558.0
% CO2 (OUT)	15.21
% O2 (OUT)	5.14
% CO (OUT)	0.10
% N2 (OUT)	79.55
P BAR	29.10
PSTK	-1.00
FINAL METER	1013.323
INT METER	976.704
MID CHECK	0.000
VM (CF) =	36.619

TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
A1	0.49	0.70	1.13	57	52	425
2	0.51	0.71	1.17	58	52	423
3	0.53	0.73	1.22	59	52	424
4	0.53	0.73	1.22	60	53	423
5	0.54	0.73	1.24	62	53	415
6	0.51	0.71	1.17	62	54	416
B1	0.48	0.69	1.10	62	55	419
2	0.50	0.71	1.15	64	56	419
3	0.50	0.71	1.15	66	57	418
4	0.54	0.73	1.24	67	58	420
5	0.53	0.73	1.22	68	58	412
6	0.49	0.70	1.13	69	59	412
AVG:	0.51	0.72	1.18	62.8	54.9	418.8

TS ('R) =	878.8	DELTA H (ABS) =	29.19
TM ('F) =	58.9	PS (ABS) =	29.03
TM ('R) =	518.9	VI (TOT) =	246.0

VM STD	=	17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.13	DSCF
VW STD	=	.04707 (VI TOT)	=	11.58	CF
BWO	=	(VW STD)/(VW STD)+(VM STD)	=	0.238	
1-BWO	=	1 - BWO	=	0.762	
Md (DRY)	=	.44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.64	LBS/LB
Ms (WET)	=	Md(1-BWO)+18(BWO)	=	27.63	LBS/LB
G	=	SQRT (TS / PS / MS)	=	1.05	
VS	=	85.49(CP)(G)(SQRT DELTA P)	=	53.80	FPS
Qs	=	3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3800260	DSCFH
				63338	DSCFM
				142610	ACFM
				83087	WSCFM

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 8
START TIME: 12:30
END TIME: 12:51

		TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
Ds (FT)	7.50							
As (SQFT)	44.18							
Y =	1.0220							
		A1	0.49	0.70	1.13	57	52	425
PIT COEFF	0.84	2	0.51	0.71	1.17	58	52	423
		3	0.53	0.73	1.22	59	52	424
IMP-1 (INT)	100	4	0.53	0.73	1.22	60	53	423
IMP-2 (INT)	100	5	0.54	0.73	1.24	62	53	415
IMP-3 (INT)	0	6	0.51	0.71	1.17	62	54	416
IMP-4 (INT)	550	B1	0.48	0.69	1.10	62	55	419
		2	0.50	0.71	1.15	64	56	419
IMP-1 (FIN)	330	3	0.50	0.71	1.15	66	57	418
IMP-2 (FIN)	106	4	0.54	0.73	1.24	67	58	420
IMP-3 (FIN)	2	5	0.53	0.73	1.22	68	58	412
IMP-4 (FIN)	558.0	6	0.49	0.70	1.13	69	59	412

% CO2 (OUT)	15.53
% O2 (OUT)	4.72
% CO (OUT)	0.10
% N2 (OUT)	79.65
P BAR	29.10
PSTK	-1.00
FINAL METER	1013.323
INT METER	976.704
MID CHECK	0.000
VM (CF) =	36.619

AVG:	0.51	0.72	1.18	62.8	54.9	418.8

TS ('R)=	878.8	DELTA H (ABS) =	29.19
TM ('F)=	58.9	PS (ABS) =	29.03
TM ('R)=	518.9	VI (TOT) =	246.0

VM STD	=	17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.13	DSCF
VW STD	=	.04707 (VI TOT)	=	11.58	CF
BWO	=	(VW STD)/(VW STD)+(VM STD)	=	0.238	
1-BWO	=	1 - BWO	=	0.762	
Md (DRY)	=	.44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.67	LBS/LB
Ms (WET)	=	Md(1-BWO)+18(BWO)	=	27.66	LBS/LB
G	=	SQRT (TS / PS / MS)	=	1.05	
VS	=	85.49(CP)(G)(SQRT DELTA P)	=	53.77	FPS
Qs	=	3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3798458	DSCFH
				63308	DSCFM
				142542	ACFM
				83048	WSCFM

VOLUMETRIC FLOW AND MOISTURE CALCULATION SHEET

FACILITY: PINETREE BETHLEHEM
UNIT : STACK
DATE : 3/28/08

RUN ID# : 9
START TIME: 13:00
END TIME: 13:21

Ds (FT)	7.50
As (SQFT)	44.18
Y =	1.0220
PIT COEFF	0.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	550
IMP-1 (FIN)	330
IMP-2 (FIN)	106
IMP-3 (FIN)	2
IMP-4 (FIN)	558.0
% CO2 (OUT)	15.48
% O2 (OUT)	4.93
% CO (OUT)	0.10
% N2 (OUT)	79.49
P BAR	29.10
PSTK	-1.00
FINAL METER	1013.323
INT METER	976.704
MID CHECK	0.000
VM (CF) =	36.619

TRAV PT	DELTA P	SQ ROOT	DELTA H	DGM IN	DGM OUT	STACK TEMP
A1	0.49	0.70	1.13	57	52	425
2	0.51	0.71	1.17	58	52	423
3	0.53	0.73	1.22	59	52	424
4	0.53	0.73	1.22	60	53	423
5	0.54	0.73	1.24	62	53	415
6	0.51	0.71	1.17	62	54	416
B1	0.48	0.69	1.10	62	55	419
2	0.50	0.71	1.15	64	56	419
3	0.50	0.71	1.15	66	57	418
4	0.54	0.73	1.24	67	58	420
5	0.53	0.73	1.22	68	58	412
6	0.49	0.70	1.13	69	59	412
AVG:	0.51	0.72	1.18	62.8	54.9	418.8

TS ('R) =	878.8	DELTA H (ABS) =	29.19
TM ('F) =	58.9	PS (ABS) =	29.03
TM ('R) =	518.9	VI (TOT) =	246.0

VM STD	=	17.64 (VM) (Y) (DELTA H ABS) / (TM)	=	37.13	DSCF
VW STD	=	.04707 (VI TOT)	=	11.58	CF
BWO	=	(VW STD)/(VW STD)+(VM STD)	=	0.238	
1-BWO	=	1 - BWO	=	0.762	
Md (DRY)	=	.44(%CO2)+.32(%O2)+.28(%CO)+.28(%N2)	=	30.67	LBS/LB
Ms (WET)	=	Md(1-BWO)+18(BWO)	=	27.66	LBS/LB
G	=	SQRT (TS / PS / MS)	=	1.05	
VS	=	85.49(CP)(G)(SQRT DELTA P)	=	53.77	FPS
Qs	=	3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS)	=	3798437	DSCFH
				63307	DSCFM
				142541	ACFM
				83048	WSCFM

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