Background Report Reference

AP-42 Section Number: 10.6.1

Background Report Section: 4

Reference Number: 12

Title: Report of Evaluation Emission Testing on the Chip Dryer Inlet and Outlet at Georgia-Pacific Corp. In Woodland Maine on October 25, 1988

Analytical Testing Consultants, Inc

November 1988

Anal. Testing Consultants, Inc. (1988)

See pp. 4, 11, 21

Ref (12)

Ref 12
Sec 4

REPORT

of

EVALUATION EMISSION TESTING

on the

CHIP DRYER INLET AND OUTLET

at

GEORGIA PACIFIC CORPORATION

in

WOODLAND, MAINE

on the report

on

OCTOBER 25, 1988

TEST REPORT #4829

ANALYTICAL TESTING CONSULTANTS, INC.

506 Broad Street
Kannapolis, N. C. 28081
(704) 932-3193

P. O. Box 767190
Roswell, Georgia 30076
(404) 587-5696

Prepared by:
cc

Distribution:
Mr. Larson Harsey
(5 copies)

Issue Date:
November 18, 1988

TABLE OF CONTENTS

INTRODUCTION

This report presents the results of evaluation emission testing performed on the chip dryer inlet and outlet at Georgia Pacific Corporation in Woodland, Maine on October 25, 1988.

The purpose of this test was to determine efficiency of the United McGill ESP which operates on the outlet side of the chip dryer. Testing was performed by EPA Method 5 for particulate and EPA 25 for total volatile organic compounds (non-methane). Additional testing for back half condensibles and formaldehyde were sampled for at the same time as the Method 5.

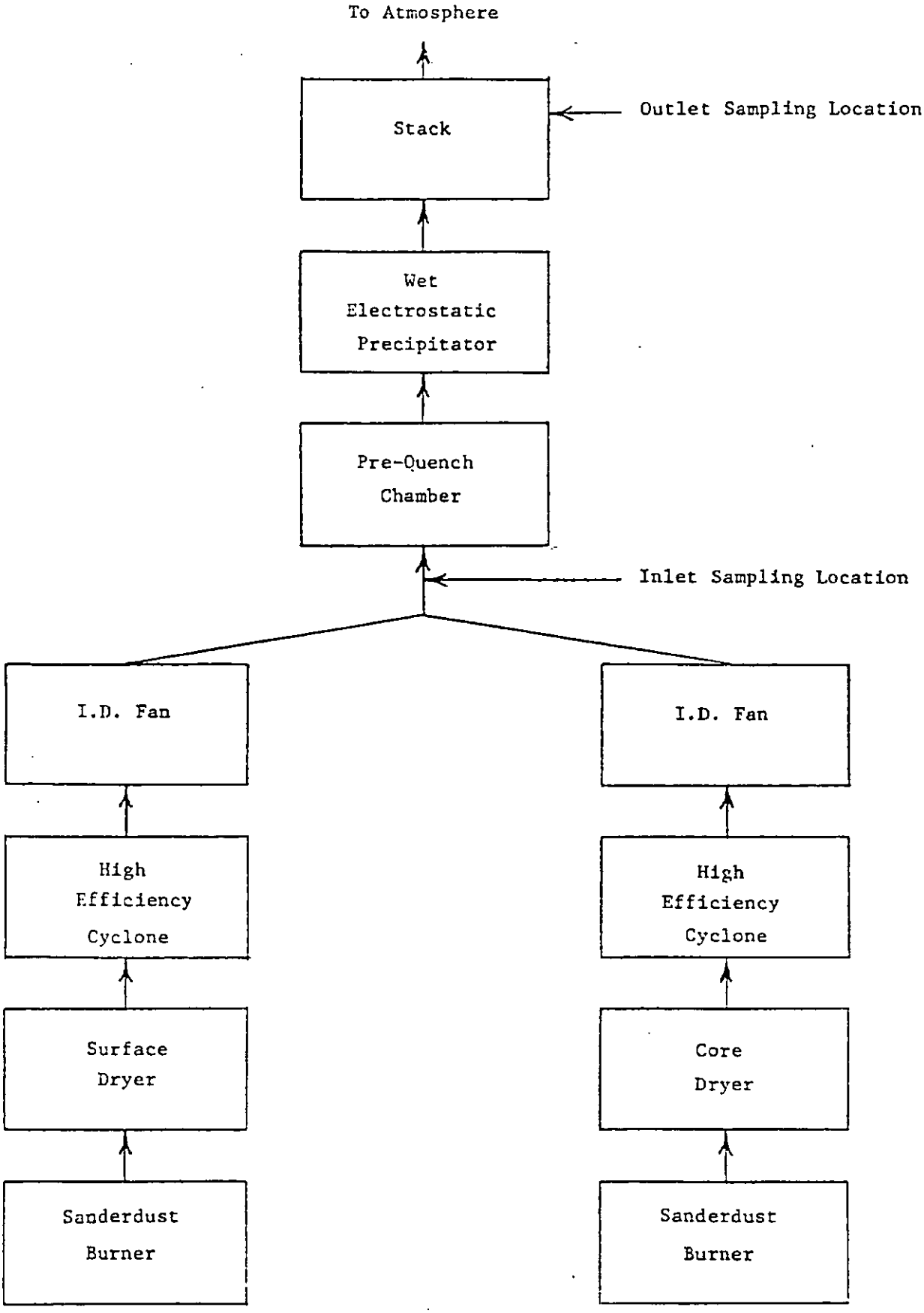
The test was conducted by ANALYTICAL TESTING CONSULTANTS, INC. Kannapolis, N. C. Members of the test team were Charles Wilkes, Richard Westbrook, Keith Poole and Dan McCombs.

SOURCE DESCRIPTION

This test was performed at the oriented Strand Board Plant operated by Georgia-Pacific located in Woodland, Maine. Oriented Strand Board (OSB) is manufactured by a process that yields plywood strength properties while using wood flakes. This process orients the wood flakes basically in two directions.

There are two wood fired dryers at the Georgia-Pacific OSB Plant, which are used to dry green wood flakes (50% moisture content, wet basis) for use in OSB production. The dryers are direct-fired, triple pass, rotary drum dryers, each equipped with its own sanderdust suspension burner. The dryers are identified as being either the "Surface" or "Core" dryer. "Surface" flakes refers to the flakes used on the outside or surface of the manufactured board and which are dried to approximately 8% moisture content. "Core" flakes are dried to a moisture content of approximately 5% and are oriented 90 degrees from the surface flake layer. Flue gases and dry wood flakes are pneumatically conveyed from each dryer to its own individual high efficiency cyclone and I.D. Fan, then to a common duct which leads to a pre-quench chamber which knocks out large flakes and/or wood fibers and also saturates and cools the incoming gas stream in order to condense any organic compounds present. The saturated gas stream passes through a United McGill three field wet electrostatic precipitator and stack to the atmosphere.

During this testing, the both dryers operated at approximately 20 tons which is capacity for the system.



Woodland, ME OSB - Flow Diagram

RESULTS SUMMARY

SYSTEM GEORGIA PACIFIC
CHIP DRYER EXHAUST
WOODLAND, MAINE

TEST DATE OCTOBER 25, 1988

PARAMETER	RUN #1-O	RUN #2-O	RUN #3-O	AVERAGE
Qs, FLOW, ACFM	87660.7	83307.7	83186.0	84718.14
Qs dry, FLOW SCFM	56278.9	52692.9	54024.9	54332.2
Vm std, CUBIC FT.	44.12	41.84	42.62	
%I	108.1	109.5	105.7	
PMR AVG, LB/HR				
DRY CATCH	3.65	3.70	4.31	3.88
DRY AND WET	6.45	6.68	7.65	6.93
Cs, GR/SCF				
DRY CATCH	.0073	.0078	.0090	.0080
DRY AND WET	0.0128	0.0141	0.0160	0.0143
ALLOWABLE, LB/HR (DRY CATCH ONLY)				8.6*
TGNMO LB/HR	37.99	18.77	19.25	
FORMALDEHYDE LB/HR	.0596	.0495	.0490	.0527

*based on limiting total waferboard plant particulate emissions to 50 Tons/Year or less, and deducting other waferboard plant emissions

RESULTS SUMMARY

SYSTEM GEORGIA PACIFIC
CHIP DRYER INLET
WOODLAND, MAINE

TEST DATE OCTOBER 25, 1988

PARAMETER	RUN 1-I	RUN 2-1	RUN 3-I	AVERAGE
Qs, FLOW, ACFM	88135	88387	86270	87597
Qs dry. FLOW SCFM	62735	60425	59797	60986
Vm std, CUBIC FT.	24.01	14.99	15.01	
%I	122.2	110.2	110.3	
PMR AVG, LB/HR DRY CATCH	80.27	54.36	55.95	63.53
DRY AND WET	189.80	126.38	142.73	152.97
Cs, GR.SCF DRY CATCH	0.134	0.0998	0.1038	0.1126
DRY AND WET	0.317	0.232	0.265	0.271
TGNMO LB/HR	83.52	143.21	60.99	
FORMALDEHYDE LB/HR	.1084	.0978	.1294	.1118

RESULTS SUMMARY

SYSTEM	GEORGIA PACIFIC CHIP DRYER EXHAUST WOODLAND, MAINE
TEST DATE	OCTOBER 25,1988

PARAMETER	RUN 4-I	RUN 4-O
Qs, FLOW, ACFM	92199	80824
Qs dry, FLOW SCFM	69788	58344
Vm std, CUBIC FT.	7.81	15.69
%I	107.8	108.9
PMR AVG, LB/HR		
DRY CATCH	78.28	5.86
DRY AND WET	118.17	7.968
Cs, GR/SCF		
DRY CATCH	0.126	0.011
DRY AND WET	0.190	0.015
FORMALDEHYDE LB/HR	.0817	.0931

EFFICIENCY SUMMARY

RUN #	TGMNO lb/hr	FORMALDEHYDE lb/hr	DRY CATCH lb/hr	DRY/WET COMB. lb/hr
1-I	83.52	.1192	80.27	189.81
2-I	143.21	.1026	54.36	126.38
3-I	60.99	.1357	55.95	142.73
4-I	--	.0817	78.28	118.17
1-O	37.99	.0596	3.65	6.45
2-O	18.77	.0495	3.70	6.68
3-O	19.25	.0490	4.31	7.65
4-O	--	.0931	5.86	7.97

EFFICIENCY

RUN #	%	%	%	%	
1	54.51	45.00	95.46	96.60	HIGH 97%
2	86.89	49.34	93.20	94.72	
3	68.45	62.14	92.30	94.64	
4	--		92.52	93.26	

RESULTS, CONCLUSIONS AND COMMENTS

Results of the particulate, formaldehyde and VOC emission testing are presented in the preceding Test Summaries. Additional information may be reviewed in the Calculations and Data Sheets sections of this report.

The average particulate emission concentration for the offical part of this testing was 3.88 lb/hr. This is below the maximum allowable level of 8.6 lb/hr. The combined wet and dry catch numbers had to be adjusted for the chemical solution (Sodium Bisulfite) in the impingers for the formaldehyde collection.

The outlet runs 1-3 were 80 minutes in order to get a 10 minute wash cycle in each run. Since the port traverses took 20 minutes the wash was started five minutes into each run so it would not be taken place during a port change. Run 4 was setup to test an entire run without a wash, but only half a run could be made due to the plant running out of chips.

SAMPLING AND ANALYTICAL PROCEDURES

Particulate testing and analysis were performed according to procedures developed by the U. S. Environmental Protection Agency (EPA) and referred to as Method 5. Sampling port locations and number of test points to be used were determined according to Method 1. The above federal test methods appear in the Code of Federal Regulations (Reference 1).

Volatile organic compound testing and analysis were performed according to EPA method 25. The formaldehyde testing and analysis were performed, modified for large impingers, by method P&CAM 125.

Test point locations and sampling port placement for velocity traverses are shown in the data sheets. Test point locations were calculated based upon a 64" diameter stack for the outlet and 68" for the inlet.

Gas sampling and analysis for oxygen content was performed in accordance with EPA method 3A on the outlet and EPA method 3 on the inlet. Carbon dioxide concentrations were determined utilizing EPA method 3, Fyrite analyzer procedure.

REFERENCES

1. CODE OF FEDERAL REGULATIONS, Title 40, Part 60, Appendix A, July 1, 1986.

CALCULATIONS

Particulate Emission Rate Calculations
Formaldehyde Emission Rate Calculation
TGNMO Emission Rate Calculation
Square Root of DP
Nomenclature
Calculation Formulae

PARTICULATE EMISSION RATE CALCULATION
DRY CATCH ONLY

DATA/CALCULATION	RUN 1-0	RUN 2-0	RUN 3-0	AVERAGE
DATE	10/25/88	10/25/88	10/25/88	
AVG DH (IN H2O)	0.87	0.77	0.78	
P ATM (IN HG)	28.76	28.76	28.76	
PM (IN HG)	28.82397	28.81661	28.81735	
PS (GUAGE)	-1.1	-1.1	-1.1	
PS (IN HG)	28.67911	28.67911	28.67911	
tM (DEG F)	63	63	67	
TM (DEG R)	523	523	527	
VM (FT3)	44.12	41.84	42.62	
VM STD (FT3)	42.91014	40.68228	41.12721	
VLQ (ML)	278	280.2	255	
VV STD (FT3)	13.09870	13.20236	12.015	
V STD (FT3)	56.00884	53.88464	53.14221	
%M	23.38685	24.50116	22.60914	23.49905
MD	0.766131	0.754988	0.773908	
MWD	29.084	29.112	29.096	
M	26.49180	26.38943	26.58728	
tS (DEG F)	147	147	146	146.6666
TS (DEG R)	607	607	606	606.6666
SUM SQRT DP	20.39	19.34	19.4	
N DP	20	20	20	
AVG SQRT DP	1.0195	0.967	0.97	
CP	0.84	0.84	0.84	
VS (FT/SEC)	65.43147	62.18229	62.09146	63.23507
DS (IN)	64	64	64	
AS (FT2)	22.32888	22.32888	22.32888	
QS, ACFM	87660.73	83307.68	83186.00	84718.14
Q STD (FT3/MIN)	73458.58	69792.97	69807.82	71019.79
Q STD DRY, SCFM	56278.93	52692.88	54024.86	54332.22
WT (GM)	0.0202	0.0206	0.0241	
PMRC (LB/HR)	3.505073	3.529992	4.188334	3.741133
DN (IN)	0.19	0.19	0.192	
AN (IN2)	0.028338	0.028338	0.028938	
TIME (MIN)	80	80	80	
PMRA (LB/HR)	3.790303	3.865358	4.428375	4.028012
%I	108.1376	109.5004	105.7311	
PMR AVG (LB/HR)	3.647688	3.697675	4.308354	3.884572
%CO2	2.3	2.6	2.5	2.466666
%O2	17.9	17.4	17.4	17.56666
%CO	0	0	0	0
%N2	79.8	80	80.1	79.96666
%EA	565.1679	467.7419	464.4458	499.1185
CS (GR/SCFD)	0.007263	0.007813	0.009041	0.008039

PARTICULATE EMISSION RATE CALCULATION
DRY CATCH ONLY

DATA/CALCULATION	RUN I-I	RUN 2-I	RUN 3-I	AVERAGE
DATE	10/25/88	10/25/88	10/25/88	
AVG DH (IN H2O)	0.84	0.19	0.32	
P ATM (IN HG)	28.76	28.76	28.76	
PM (IN HG)	28.82176	28.77397	28.78352	
PS (GUAGE)	2.6	2.6	2.6	
PS (IN HG)	28.95117	28.95117	28.95117	
tM (DEG F)	58	61	67	
TM (DEG R)	518	521	527	
VM (FT3)	24.01	14.99	15.01	
VM STD (FT3)	23.57519	14.60952	14.46726	
VLQ (ML)	43	41	37	
VV STD (FT3)	2.026058	1.931823	1.743352	
V STD (FT3)	25.60125	16.54134	16.21061	
%M	7.913904	11.67875	10.75438	10.11568
MD	0.920860	0.883212	0.892456	
MWD	29.28	29.284	29.436	
M	28.38731	27.96616	28.20612	
tS (DEG F)	198	196	194	196
TS (DEG R)	658	656	654	656
SUM SQRT DP	17.2332	21.7008	21.3043	
N DP	19	24	24	
AVG SQRT DP	0.907010	0.9042	0.887679	
CP	0.84	0.84	0.84	
VS (FT/SEC)	58.27386	58.44005	57.04056	57.91816
DS (IN)	68	68	68	
AS (FT2)	25.20722	25.20722	25.20722	
QS, ACFM	88135.33	88386.68	86270.05	87597.36
Q STD (FT3/MIN)	68126.65	68415.60	67003.69	67848.65
Q STD DRY, SCFM	62735.17	60425.51	59797.85	60986.18
WT (GM)	0.2052	0.0945	0.0973	
PMRC (LB/HR)	72.24254	51.71016	53.20737	59.05336
DN (IN)	0.173	0.13	0.13	
AN (IN2)	0.023494	0.013266	0.013266	
TIME (MIN)	47.5	60	60	
PMRA (LB/HR)	88.30172	57.01268	58.70195	68.00545
%I	122.2295	110.2543	110.3267	
PMR AVG (LB/HR)	80.27213	54.36142	55.95466	63.52940
%CO2	3.9	4	5.2	4.366666
%O2	16.4	16.1	15.1	15.86666
%CO	0	0	0	0
%N2	79.7	79.9	79.7	79.76666
%EA	353.3873	322.4126	254.1745	309.9915
CS (GR/SCFD)	0.134303	0.099807	0.103774	0.112628

PARTICULATE EMISSION RATE CALCULATION
DRY CATCH ONLY

DATA/CALCULATION	RUN 4-I	RUN 4-O
DATE	10/25/88	10/25/88
AVG DH (IN H2O)	28.76	28.76
P ATM (IN HG)	28.76	28.76
PM (IN HG)	30.87470	30.87470
PS (GUAGE)	2.6	-1.1
PS (IN HG)	28.95117	28.67911
tM (DEG F)	56	49
TM (DEG R)	516	509
VM (FT3)	7.81	15.69
VM STD (FT3)	8.246629	16.79501
VLQ (ML)	18.5	91.2
VV STD (FT3)	0.871676	4.297129
V STD (FT3)	9.118306	21.09214
%M	9.559631	20.37312
MD	0.904403	0.796268
MWD	29.392	29.112
M	28.30296	26.84813
tS (DEG F)	191	141
TS (DEG R)	651	601
SUM SQRT DP	11.43	9.51
N DP	12	10
AVG SQRT DP	0.9525	0.951
CP	0.84	0.84
VS (FT/SEC)	60.96073	60.32836
DS (IN)	68	64
AS (FT2)	25.20722	22.32888
QS, ACFM	92199.04	80823.92
Q STD (FT3/MIN)	77165.04	73272.43
Q STD DRY, SCFM	69788.34	58344.54
WT (GM)	0.0673	0.0122
PMRC (LB/HR)	75.34966	5.607117
DN (IN)	0.13	0.19
AN (IN2)	0.013266	0.028338
TIME (MIN)	30	30
PMRA (LB/HR)	81.20537	6.104515
%I	107.7713	108.8708
PMR AVG (LB/HR)	78.27752	5.855816
%CO2	4.8	2.6
%O2	15.6	17.4
%CO	0	0
%N2	79.6	80
%EA	288.1205	467.7419
CS (GR/SCFD)	0.125922	0.011208

PARTICULATE EMISSION RATE CALCULATION
FRONT AND BACK HALF COMBINED

DATA/CALCULATION	RUN I-I	RUN 2-I	RUN 3-I	AVERAGE
DATE	10/25/88	10/25/88	10/25/88	
AVG DH (IN H2O)	0.84	0.19	0.32	
P ATM (IN HG)	28.76	28.76	28.76	
PM (IN HG)	28.82176	28.77397	28.78352	
PS (GUAGE)	2.6	2.6	2.6	
PS (IN HG)	28.95117	28.95117	28.95117	
tM (DEG F)	58	61	67	
TM (DEG R)	518	521	527	
VM (FT3)	24.01	14.99	15.01	
VM STD (FT3)	23.57519	14.60952	14.46726	
VLQ (ML)	43	41	37	
VV STD (FT3)	2.026058	1.931823	1.743352	
V STD (FT3)	25.60125	16.54134	16.21061	
%M	7.913904	11.67875	10.75438	10.11568
MD	0.920860	0.883212	0.892456	
MWD	29.28	29.284	29.436	
M	28.38731	27.96616	28.20612	
tS (DEG F)	198	196	194	196
TS (DEG R)	658	656	654	656
SUM SQRT DP	17.2332	21.7008	21.3043	
N DP	19	24	24	
AVG SQRT DP	0.907010	0.9042	0.887679	
CP	0.84	0.84	0.84	
VS (FT/SEC)	58.27386	58.44005	57.04056	57.91816
DS (IN)	68	68	68	
AS (FT2)	25.20722	25.20722	25.20722	
QS, ACFM	88135.33	88386.68	86270.05	87597.36
Q STD (FT3/MIN)	68126.65	68415.60	67003.69	67848.65
Q STD DRY, SCFM	62735.17	60425.51	59797.85	60986.18
WT (GM)	0.4852	0.2197	0.2482	
PMRC (LB/HR)	170.8191	120.2192	135.7252	142.2545
DN (IN)	0.173	0.13	0.13	
AN (IN2)	0.023494	0.013266	0.013266	
TIME (MIN)	47.5	60	60	
PMRA (LB/HR)	208.7914	132.5469	149.7412	163.6932
%I	122.2295	110.2543	110.3267	
PMR AVG (LB/HR)	189.8052	126.3831	142.7332	152.9738
%CO2	3.9	4	5.2	4.366666
%O2	16.4	16.1	15.1	15.86666
%CO	0	0	0	0
%N2	79.7	79.9	79.7	79.76666
%EA	353.3873	322.4126	254.1745	309.9915
CS (GR/SCFD)	0.317564	0.232038	0.264716	0.271439

PARTICULATE EMISSION RATE CALCULATION
FRONT AND BACK HALF COMBINED

DATA/CALCULATION	RUN 1-0	RUN 2-0	RUN 3-0	AVERAGE
DATE	10/25/88	10/25/88	10/25/88	
AVG DH (IN H2O)	0.87	0.77	0.78	
P ATM (IN HG)	28.76	28.76	28.76	
PM (IN HG)	28.82397	28.81661	28.81735	
PS (GUAGE)	-1.1	-1.1	-1.1	
PS (IN HG)	28.67911	28.67911	28.67911	
tM (DEG F)	63	63	67	
TM (DEG R)	523	523	527	
VM (FT3)	44.12	41.84	42.62	
VM STD (FT3)	42.91014	40.68228	41.12721	
VLQ (ML)	278	280.2	255	
VV STD (FT3)	13.09870	13.20236	12.015	
V STD (FT3)	56.00884	53.88464	53.14221	
%M	23.38685	24.50116	22.60914	23.49905
MD	0.766131	0.754988	0.773908	
MWD	29.084	29.112	29.096	
M	26.49180	26.38943	26.58728	
tS (DEG F)	147	147	146	146.6666
TS (DEG R)	607	607	606	606.6666
SUM SQRT DP	20.39	19.34	19.4	
N DP	20	20	20	
AVG SQRT DP	1.0195	0.967	0.97	
CP	0.84	0.84	0.84	
VS (FT/SEC)	65.43147	62.18229	62.09146	63.23507
DS (IN)	64	64	64	
AS (FT2)	22.32888	22.32888	22.32888	
QS, ACFM	87660.73	83307.68	83186.00	84718.14
Q STD (FT3/MIN)	73458.58	69792.97	69807.82	71019.79
Q STD DRY, SCFM	56278.93	52692.88	54024.86	54332.22
WT (GM)	0.0357	0.0372	0.0428	
PMRC (LB/HR)	6.194609	6.374548	7.438203	6.669120
DN (IN)	0.19	0.19	0.192	
AN (IN2)	0.028338	0.028338	0.028938	
TIME (MIN)	80	80	80	
PMRA (LB/HR)	6.698704	6.980162	7.8645	7.181122
%I	108.1376	109.5004	105.7311	
PMR AVG (LB/HR)	6.446657	6.677355	7.651351	6.925121
%CO2	2.3	2.6	2.5	2.466666
%O2	17.9	17.4	17.4	17.56666
%CO	0	0	0	0
%N2	79.8	80	80.1	79.96666
%EA	565.1679	467.7419	464.4458	499.1185
CS (GR/SCFD)	0.012837	0.014109	0.016057	0.014334

PARTICULATE EMISSION RATE CALCULATION
COMBINED FRONT AND BACK HALF

DATA/CALCULATION	RUN 4-I	RUN 4-O
DATE	10/25/88	10/25/88
AVG DH (IN H2O)	28.76	28.76
P ATM (IN HG)	28.76	28.76
PM (IN HG)	30.87470	30.87470
PS (GUAGE)	2.6	-1.1
PS (IN HG)	28.95117	28.67911
tM (DEG F)	56	49
TM (DEG R)	516	509
VM (FT3)	7.81	15.69
VM STD (FT3)	8.246629	16.79501
VLQ (ML)	18.5	91.2
VV STD (FT3)	0.871676	4.297129
V STD (FT3)	9.118306	21.09214
%M	9.559631	20.37312
MD	0.904403	0.796268
MWD	29.392	29.112
M	28.30296	26.84813
tS (DEG F)	191	141
TS (DEG R)	651	601
SUM SQRT DP	11.43	9.51
N DP	12	10
AVG SQRT DP	0.9525	0.951
CP	0.84	0.84
VS (FT/SEC)	60.96073	60.32836
DS (IN)	68	64
AS (FT2)	25.20722	22.32888
QS, ACFM	92199.04	80823.92
Q STD (FT3/MIN)	77165.04	73272.43
Q STD DRY, SCFM	69788.34	58344.54
WT (GM)	0.1016	0.0166
PMRC (LB/HR)	113.7522	7.629356
DN (IN)	0.13	0.19
AN (IN2)	0.013266	0.028338
TIME (MIN)	30	30
PMRA (LB/HR)	122.5923	8.306143
%I	107.7713	108.8708
PMR AVG (LB/HR)	118.1723	7.967749
%CO2	4.8	2.6
%O2	15.6	17.4
%CO	0	0
%N2	79.6	80
%EA	288.1205	467.7419
CS (GR/SCFD)	0.190100	0.015250

FORMALDEHYDE EMISSION RATE CALCULATION

DATA/CALCULATION	RUN I-I	RUN 2-I	RUN 3-I	AVERAGE
DATE	10/25/88	10/25/88	10/25/88	
AVG DH (IN H2O)	0.84	0.19	0.32	
P ATM (IN HG)	28.76	28.76	28.76	
PM (IN HG)	28.82176	28.77397	28.78352	
PS (GUAGE)	2.6	2.6	2.6	
PS (IN HG)	28.95117	28.95117	28.95117	
tM (DEG F)	58	61	67	
TM (DEG R)	518	521	527	
VM (FT3)	24.01	14.99	15.01	
VM STD (FT3)	23.57519	14.60952	14.46726	
VLQ (ML)	43	41	37	
VV STD (FT3)	2.026058	1.931823	1.743352	
V STD (FT3)	25.60125	16.54134	16.21061	
%M	7.913904	11.67875	10.75438	10.11568
MD	0.920860	0.883212	0.892456	
MWD	29.28	29.284	29.436	
M	28.38731	27.96616	28.20612	
tS (DEG F)	198	196	194	196
TS (DEG R)	658	656	654	656
SUM SQRT DP	17.2332	21.7008	21.3043	
N DP	19	24	24	
AVG SQRT DP	0.907010	0.9042	0.887679	
CP	0.84	0.84	0.84	
VS (FT/SEC)	58.27386	58.44005	57.04056	57.91816
DS (IN)	68	68	68	
AS (FT2)	25.20722	25.20722	25.20722	
QS, ACFM	88135.33	88386.68	86270.05	87597.36
Q STD (FT3/MIN)	68126.65	68415.60	67003.69	67848.65
Q STD DRY, SCFM	62735.17	60425.51	59797.85	60986.18
WT (GM)	0.000277	0.00017	0.000225	
PMRC (LB/HR)	0.097520	0.093023	0.123038	0.104527
DN (IN)	0.173	0.13	0.13	
AN (IN2)	0.023494	0.013266	0.013266	
TIME (MIN)	47.5	60	60	
PMRA (LB/HR)	0.119198	0.102562	0.135744	0.119168
%I	122.2295	110.2543	110.3267	
PMR AVG (LB/HR)	0.108359	0.097793	0.129391	0.111848
%CO2	3.9	4	5.2	4.366666
%O2	16.4	16.1	15.1	15.86666
%CO	0	0	0	0
%N2	79.7	79.9	79.7	79.76666
%EA	353.3873	322.4126	254.1745	309.9915
CS (GR/SCFD)	0.000181	0.000179	0.000239	0.000200

FORMALDEHYDE EMISSION CALCULATION

DATA/CALCULATION	RUN 1-0	RUN 2-0	RUN 3-0	AVERAGE
DATE	10/25/88	10/25/88	10/25/88	
AVG DH (IN H2O)	0.87	0.77	0.78	
P ATM, (IN HG)	28.76	28.76	28.76	
PM (IN HG)	28.82397	28.81661	28.81735	
PS (GUAGE)	-1.1	-1.1	-1.1	
PS (IN HG)	28.67911	28.67911	28.67911	
tM (DEG F)	63	63	67	
TM (DEG R)	523	523	527	
VM (FT3)	44.12	41.84	42.62	
VM STD (FT3)	42.91014	40.68228	41.12721	
VLQ (ML)	278	280.2	255	
VV STD (FT3)	13.09870	13.20236	12.015	
V STD (FT3)	56.00884	53.88464	53.14221	
%M	23.38685	24.50116	22.60914	23.49905
MD	0.766131	0.754988	0.773908	
MWD	29.084	29.112	29.096	
M	26.49180	26.38943	26.58728	
tS (DEG F)	147	147	146	146.6666
TS (DEG R)	607	607	606	606.6666
SUM SQRT DP	20.39	19.34	19.4	
N DP	20	20	20	
AVG SQRT DP	1.0195	0.967	0.97	
CP	0.84	0.84	0.84	
VS (FT/SEC)	65.43147	62.18229	62.09146	63.23507
DS (IN)	64	64	64	
AS (FT2)	22.32888	22.32888	22.32888	
QS. ACFM	87660.73	83307.68	83186.00	84718.14
Q STD (FT3/MIN)	73458.58	69792.97	69807.82	71019.79
Q STD DRY, SCFM	56278.93	52692.88	54024.86	54332.22
WT (GM)	0.00033	0.000276	0.000274	
PMRC (LB/HR)	0.057261	0.047295	0.047618	0.050724
DN (IN)	0.19	0.19	0.192	
AN (IN2)	0.028338	0.028338	0.028938	
TIME (MIN)	80	80	80	
PMRA (LB/HR)	0.061920	0.051788	0.050347	0.054685
%I	108.1376	109.5004	105.7311	
PMR AVG (LB/HR)	0.059590	0.049541	0.048982	0.052705
%CO2	2.3	2.6	2.5	2.466666
%O2	17.9	17.4	17.4	17.56666
%CO	0	0	0	0
%N2	79.8	80	80.1	79.96666
%EA	565.1679	467.7419	464.4458	499.1185
CS (GR/SCFD)	0.000118	0.000104	0.000102	0.000108

FORMALDEHYDE EMISSION RATE CALCULATION

DATA/CALCULATION	RUN 4-I	RUN 4-O
DATE	10/25/88	10/25/88
AVG DH (IN H2O)	28.76	28.76
P ATM (IN HG)	28.76	28.76
PM (IN HG)	30.87470	30.87470
PS (GUAGE)	2.6	-1.1
PS (IN HG)	28.95117	28.67911
tM (DEG F)	56	49
TM (DEG R)	516	509
VM (FT3)	7.81	15.69
VM STD (FT3)	8.246629	16.79501
VLQ (ML)	18.5	91.2
VV STD (FT3)	0.871676	4.297129
V STD (FT3)	9.118306	21.09214
%M	9.559631	20.37312
MD	0.904403	0.796268
MWD	29.392	29.112
M	28.30296	26.84813
tS (DEG F)	191	141
TS (DEG R)	651	601
SUM SQRT DP	11.43	9.51
N DP	12	10
AVG SQRT DP	0.9525	0.951
CP	0.84	0.84
VS (FT/SEC)	60.96073	60.32836
DS (IN)	68	64
AS (FT2)	25.20722	22.32888
QS, ACFM	92199.04	80823.92
Q STD (FT3/MIN)	77165.04	73272.43
Q STD DRY, SCFM	69788.34	58344.54
WT (GM)	0.000070	0.000194
PMRC (LB/HR)	0.078596	0.089162
DN (IN)	0.13	0.19
AN (IN2)	0.013266	0.028338
TIME (MIN)	30	30
PMRA (LB/HR)	0.084704	0.097071
%I	107.7713	108.8708
PMR AVG (LB/HR)	0.081650	0.093117
%CO2	4.8	2.6
%O2	15.6	17.4
%CO	0	0
%N2	79.6	80
%EA	288.1205	467.7419
CS (GR/SCFD)	0.000131	0.000178

TGNMO EMISSION RATE CALCULATION

TGNMO EM. RT., LB/HR = mg/M x scfm x .00000375

.00000375 = 60/(35.315 x 1000 x 453.6)

RUN #	mg/M3	scfm	LB/HR	EFFICIENCY
1-I	355.00	62735.17	83.52	
2-I	632.00	60425.51	143.21	
3-I	272.00	59797.85	60.99	
1-O	180.00	56278.93	37.99	54.51
2-O	95.00	52692.88	18.77	86.89
3-O	95.00	54024.86	19.25	68.45

SUM SQRT DP CALCULATION

DATE 10/25/88

RUN 1		RUN 2		RUN 3	
DP	SQRT DP	DP	SQRT DP	DP	SQRT DP
0.79	0.888819	0.65	0.806225	0.65	0.806225
0.97	0.984885	0.88	0.938083	0.8	0.894427
1	1	0.97	0.984885	0.93	0.964365
1.1	1.048808	0.97	0.984885	0.93	0.964365
1.1	1.048808	0.97	0.984885	0.98	0.989949
1	1	0.97	0.984885	0.93	0.964365
1	1	0.88	0.938083	0.93	0.964365
1	1	0.88	0.938083	0.94	0.969535
1.1	1.048808	1	1	0.93	0.964365
1.1	1.048808	1	1	0.98	0.989949
1.1	1.048808	1	1	1	1
1.1	1.048808	1	1	1.1	1.048808
1.1	1.048808	1.1	1.048808	1.1	1.048808
1.2	1.095445	1.1	1.048808	1.1	1.048808
1.2	1.095445	1.1	1.048808	1.1	1.048808
0.7	0.836660	0.6	0.774596	0.65	0.806225
1	1	0.79	0.888819	0.97	0.984885
1.1	1.048808	0.94	0.969535	0.88	0.938083
1.1	1.048808	1	1	1	1
1.1	1.048808	1	1	1	1
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	20.38934		19.33939		19.39634

SUM SQRT DP CALCULATION

DATE OCTOBER 25, 1988

RUN 1 - I		RUN 2 - I		RUN 3 - I	
DP	SQRT DP	DP	SQRT DP	DP	SQRT DP
0.78	0.883176	0.86	0.927361	0.86	0.927361
0.78	0.883176	0.86	0.927361	0.83	0.911043
0.8	0.894427	0.83	0.911043	0.81	0.9
0.85	0.921954	0.83	0.911043	0.83	0.911043
0.81	0.9	0.86	0.927361	0.83	0.911043
0.81	0.9	0.86	0.927361	0.83	0.911043
0.81	0.9	0.86	0.927361	0.86	0.927361
0.84	0.916515	0.86	0.927361	0.87	0.932737
0.84	0.916515	0.86	0.927361	0.83	0.911043
0.85	0.921954	0.83	0.911043	0.85	0.921954
0.85	0.921954	0.83	0.911043	0.87	0.932737
0.85	0.921954	0.83	0.911043	0.83	0.911043
0.74	0.860232	0.78	0.883176	0.73	0.854400
0.78	0.883176	0.86	0.927361	0.76	0.871779
0.85	0.921954	0.85	0.921954	0.76	0.871779
0.85	0.921954	0.83	0.911043	0.73	0.854400
0.9	0.948683	0.83	0.911043	0.83	0.911043
0.88	0.938083	0.83	0.911043	0.79	0.888819
0.77	0.877496	0.86	0.927361	0.79	0.888819
	0	0.83	0.911043	0.79	0.888819
	0	0.85	0.921954	0.71	0.842614
	0	0.75	0.866025	0.71	0.842614
	0	0.61	0.781024	0.65	0.806225
	0	0.61	0.781024	0.6	0.774596
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	0		0		0
	17.23320		21.70080		21.30432

SUM SQRT DP CALCULATION

DATE OCTOBER 25, 1988

RUN 4 - I		RUN 4 - O	
DP	SQRT DP	DP	SQRT DP
1	1	0.64	0.8
0.98	0.989949	0.85	0.921954
0.96	0.979795	0.9	0.948683
0.95	0.974679	0.95	0.974679
0.95	0.974679	0.95	0.974679
0.95	0.974679	0.9	0.948683
0.95	0.974679	0.95	0.974679
0.91	0.953939	0.97	0.984885
0.88	0.938083	0.97	0.984885
0.88	0.938083	1	1
0.75	0.866025		0
0.75	0.866025		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	0		0
	11.43061		9.513130

NOMENCLATURE

AN (square inches), Cross sectionl area of nozzle

AS (square feet), Cross sectional area of stack

CP Pitot tube calibration coefficient

%EA Precent Excess Air

F (scfd/10 6 BTU), F factor

DH (inches of water) Average orifice meter reading

HI (million BTU/hr), Heat Input Rate

%I Percent Isokineticity

M (lb/lb mole), Molecular Weight of wet gas

%M Percent Moisture

MD Mole fraction of dry gas

MWD (lb/lb mole) molecular weight of dry gas

N DP Number of sample points

P ATM (in Hg), Local atmospheric pressure

PM (in Hg), Absolute pressure in dry gas meter

PS (in Hg), Absolute stack pressure

PS guage (inches of water), Measured static stack pressure (gage)

P STD (29.92 in Hg), Standard pressure

PMRA (lb/hr), Pollutant mass rate based on ratio of areas

PMR AVG. (lb/hr), Average pollutant mass rate

PMRC (lb/hr), Pollutant mass rate based on concentration

PMRU (lb/million BTU), Specific emission rate

DP (inches of water), Velocity pressure

QS (cubic feet/min.) Actual stack volume flow rate

Q STD (cubic feet/min.), Stack volume flow rate at standard conditions

TM (degrees R), Average dry gas meter temperature

TS (degrees R) Average stack temperature

T STD (528 degrees R), Standard temperature

VLC (ml), Liquid volume

VM (cubic feet), Sample volume measured by dry gas meter

VM STD (cubic feet), Sample volume at standard conditions

VS (ft/sec), stack velocity

VV STD (cubic feet), Volume of water vapor collected, corrected to standard conditions

WT (gm), Total weight of particulate collected

Θ (min), Duration of test

CALCULATION FORMULAE

1. Absolute pressure in dry gas meter

   PM = P ATM + DH/13.6

2. Absolute Stack Pressure

   PS = P ATM + PS gauge/13.6

3. Sample volume at standard conditions

   VM STD = (VM)(T STD/TM)(PM/P STD)

4. Volume of water collected, corrected to standard conditions

   VV STD = (.00267)(VLQ)(T STD/P STD)

5. Total sample volume at standard conditions

   V STD = VM STD + VV STD

6. Percent moisture is stack gas

   %M = (100)(VV STD)/V STD

7. Mole Fraction of dry gas

   MD = (100-%M)/100

8. Molecular weight of the wet gas

   M = (MWD)(MD) + 18(1-MD)

9. Stack velocity

   VS = (85.48)(CP)((TS/(PS)(PM))$^{1/2}$(Sum DP$^{1/2}$/N DP))

10. Stack volume flow rate

    QS = (60)(VS)(AS)

11. Stack volume flow rate, standard conditionsincluding moisture

$$Q_{STD} = (T_{STD}/P_{STD})(P_S/T_S)(Q_S)$$

12. Stack volume flow rate standard conditions dry

$$Q_{STD\ DRY} = (Q_{STD})(1-\%M)$$

13. Pollutant mass rate, concentration basis

$$PMRC = (.1323)(WT)(Q_{STD})/V_{STD}$$

14. pollutant mass rate ratio of areas basis

$$PMRA = (.1323)(WT)(A_S)/(Q)(A_N)(144)$$

15. Percent Isokineticity

$$\%I = (100)(PMRA)/PMRC$$

16. Average pollutant mass rate

$$PMR\ AVG = (PMRA + PMRC)/2$$

17. % excess air

$$\%EA = \frac{(100)(\%oxygen - (.5)(\%carbon\ monoxide)}{(.264)(\%nitrogen) - \%oxygen + (.5)(\%carbon\ monoxide)}$$

18. Heat input rate

$$HI = ((.6)(Q_{STD\ DRY})/F)((20.9 - \%oxygen)/20.9)$$

19. Specific emission rate

$$PMRU = PMR\ AVG/HI$$

DATA SHEETS

Method 5 Sampling Data Sheets
Method 25 Sampling Data Sheets
Impinger Data Sheets
Temperature Data Sheets
Orsat Data Sheets
Chain of Custody Sheets
Test Survey Data
Equal Area Determinations
Laboratory Reports
Calibration Information (supplied upon request)

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT G.P. DATE 10/25/95

LOCATION Woodland, Mo. SOURCE ESP - Outlet

TEST TEAM DM, KP RUN # 1-0

P_{bar} 28.76

P_g -1.1

MODULE BNW-1

FILTER B515

NOZZLE .32

PITOT .33

METHOD 5

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
9:45	A 1	1	56	148	.79	.62	972.96	
:49	2	1	57	148	.97	.79	974.92	
:53	3	2	57	148	1.0	.83	977.02	
:57	4	2	58	148	1.1	.93	—	
10:01	5	2	59	149	1.1	.93	981.42	
:04	SHUT DOWN						983.66	
10:07	B1	2	61	148	1.0	.83	983.66	
	2	2	61	148	1.0	.83	985.89	
	3	2	62	148	1.0	.83	988.03	
	4	2	62	148	1.1	.93	990.23	
	5	2	63	147	1.1	.93	—	
	SHUT DOWN						994.79	
10:29	C 1	2	64	147	1.0	.83	994.79	
	2	2	64	145	1.1	.93	997.64	
	3	2	64	143	1.1	.93	999.33	
	4	2	66	143	1.2	.99	—	
	5	2	66	144	1.2	.99	004.12	
	SHUT DOWN						006.48	
AVERAGE/NET			63	147		.87	4.4.12	

NOTES:

LEAK RATES:
Start @ <.005 @ 16
End @

Pitot: OK
Start
A 7.2 B 5.8
End
A B

SETUP:
F 1.54
t_m 75
% H_2O 20
NOZZLE
C 0.66
t_s 140
Theo. Pitot 2.25

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT CP DATE 10/25/88

LOCATION Woodland Me SOURCE ESP - Outlet

TEST TEAM DM, KP RUN # 1-0

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
10:51	D 1	2	66	144	.70	.56	006.48	
:55	2	2	67	148	1.0	.83	—	
:59	3	2	68	149	1.1	.93	010.45	
11:03	4	2	69	150	1.1	.93	12.69	
:07	5	2	70	151	1.1	.93	14.89	
:11	SHUTDOWN And Run						17.08	

P_{bar} _____

P_s _____

MODULE _____

FILTER _____

NOZZLE _____

PITOT _____

METHOD _____

LEAK RATES:
Start @ _____
End @ <.005 10
Pitot:
Start
A ___ B ___
End OK
A 7.6 B 8.6

SETUP:
g _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_s _____
Theo. Pitot _____

AVERAGE/NET

NOTES:

ANALYTICAL TESTING CONSULTANTS. INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT GP DATE 10/25/88

LOCATION Woodland Mc SOURCE ESP- Outlet

TEST TEAM CBM, KP RUN # 2-0

P_{bar} _____

P_g -1.1

MODULE Run-1

FILTER B518

NOZZLE .35

PITOT .35

METHOD _____

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
12:15	A1	1	61	142	.65	.53	17.67	17.67
:19	2	1	62	144	.88	.72	19.55	19.55
:23	3	2	62	144	.97	.77	21.52	
:27	4	2	62	146	.97	.77	23.64	
:31	5	2	62	147	.97	.77	25.78	
:35	SHUT DOWN						27.72	
:37	B1	3	62	146	.97	.77	27.72	
:41	2	3	63	147	.88	.72	—	
:45	3	3	63	147	.88	.72	32.01	
:49	4	4	63	148	1.0	.83	33.88	
:53	5	4	63	148	1.0	.83	36.08	
:57	SHUTDOWN						38.41	
1:00	C1	3	63	144	1.0	.83	38.11	
:02	2	3	64	148	1.0	.83	40.30	
:08	3	3	64	148	1.1	.83	42.58	
:12	4	3	65	148	1.1	.93	45.37	
:16	5	3	65	148	1.1	.93	—	
:20							47.45	
AVERAGE/NET			63	147		.77	41.80	

NOTES:

LEAK RATES:
Start @ <.015 10
End @ _____
Pitot: Start OK
A 6.8 B 7.2
End
A____ B____

SETUP:
g _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_s _____
Theo. Pitot _____

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT GP DATE 10/25/88

LOCATION Woodland, Me SOURCE ESP - Outlet

TEST TEAM DM, KP RUN # 2-0

P_{bar} _____

P_s _____

MODULE _____

FILTER _____

NOZZLE _____

PITOT _____

METHOD _____

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
1:25	01	2	63	142	.60	.48	49.44	
:29	2	2	63	147	.79	.62	—	
:33	3	2	65	148	.94	.74	53.09	
:37	4	2	65	148	1.0	.83	55.18	
:41	5	2	66	150	1.0	.83	57.47	
:45	SHUTDOWN						59.51	
AVERAGE/NET								

LEAK RATES:
Start @ _____
End @ <.015 5
Pitot:
Start
A _____ B _____
End OK
A 7.5 B 8.2

SETUP:
g _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t _____
Theo. Pitot _____

NOTES:

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT GP DATE 10/25/88

LOCATION Woodland, Me. SOURCE ESP - Outlet

TEST TEAM DM, KP RUN # 3-D

P_{bar} _____

P_g _____

MODULE RNW 1

FILTER B516

NOZZLE 33

PITOT 34

METHOD 5

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
3:45	A1	2	66	134	.65	.53	59.74	Begin
:49	2	2	67	143	.80	.65	61.65	
:53	3	3	67	145	.93	.76	63.53	
:57	4	4	67	147	.93	.76	65.78	
4:01	5	4	67	148	.98	.80	67.78	
:05	SHUTDOWN						69.94	
:07	B1	4	67	148	.93	.76	69.94	
:11	2	4	67	150	.93	.76	72.12	
:15	3	4	67	149	.94	.76	74.22	
:19	4	4	67	147	.93	.76	76.33	
:23	5	4	68	147	.98	.80	78.58	
:27	SHUTDOWN						80.79	
:30	C1	5	67	144	0.10	.83	80.79	
:34	2	5	67	146	1.1	.93	83.11	
:38	3	5	67	147	1.1	.93	—	
:42	4	5	67	146	1.1	.93	—	
:46	5	5	68	146	1.1	.93	89.98	
:50	SHUTDOWN						92.28	
AVERAGE/NET			67	146		.79	42.11	

LEAK RATES:
Start @
< .01 /0
End @
_____
Pitot: OK
Start
A 7.2 B 8.1
End
A____ B____

SETUP:
g _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_m _____
Theo. Pitot
_____

NOTES:

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT G.P. DATE 10/25/88

LOCATION Woodland, Mo. SOURCE ESP - Outlet

TEST TEAM DM, KP RUN # 3-0

P_{bar} _____

P_s _____

MODULE _____

FILTER _____

NOZZLE _____

PITOT _____

METHOD _____

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
4:54	01	3	67	139	.65	.53	92.28	
:58	2	5	67	146	.97	.77	94.04	
:02	3	4	67	148	.88	.72	96.23	
:06	4	4	67	149	.10	.83	98.43	
:10	5	4	66	149	1.0	.83	100.42	
:14	SHUTDOWN						102.36	
AVERAGE/NET								

LEAK RATES:
Start @ _____
End <.01 @ 6

Pitot:
Start
A _____ B _____
End OK
A 7.0 B 8.3

SETUP:
g _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_s _____
Theo. Pitot
_____

NOTES:

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT G-P Woodland DATE Oct 25, 1988

LOCATION Woodland ME. SOURCE ESP Exhaust

TEST TEAM KP DM RUN # 4-0

P_{bar} _____

P_s _____

MODULE PNW-1

FILTER B-522

NOZZLE .35

PITOT .35

METHOD 5-in

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
8:10	A1	3	47	139	.64	.51	102.55	
:13	2	3	47	140	.85	.68	104.84	
:16	3	3	47	141	.90	.73	106.11	
:19	4	3	47	142	.95	.76	107.59	
:21	5	3	48	142	.95	.76	109.68	
:24	SHUTDOWN						110.49	
:25	B1	5	49	140	.96	.73	110.49	
:28	2	6	50	142	.95	.76	112.05	
:31	3	6	51	142	.97	.79	113.49	
:34	4	7	51	142	.97	.77	115.18	
:37	5	7	52	144	1.0	.83	116.25	
:40	SHUT DOWN						118.24	
AVERAGE/NET			49	141		.73	15.69	

LEAK RATES:
Start @ 2.02 D
End @

Pitot:
Start
A____ B____

End
A____ B____

SETUP:
E _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_s _____
Theo. Pitot
_____

NOTES:

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT C.P. DATE 10/25/88

LOCATION Woodland, ME. SOURCE ESP Inlet

TEST TEAM RW, CW RUN # 1-I

P_{bar} 28.76

P_g +2.6

MODULE RW-2

FILTER B519

NOZZLE 31

PITOT 73

METHOD 5

TIME 9:53	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
00	A 1	2.0	53	196	0.78	0.80	208.94	
02.5	2	2.0	53	197	0.78	0.80	210.20	
05	3	2.5	53	197	0.80	0.83	—	
07.5	4	2.5	54	197	0.85	0.87	—	
10	5	2.5	54	197	0.81	0.84	213.95	
12.5	6	2.5	55	198	0.81	0.84	—	
15	7	3.0	55	198	0.81	0.84	—	
17.5	8	3.0	56	199	0.84	0.86	—	
20	9	3.0	57	198	0.84	0.86	—	
22.5	10	3.0	58	198	0.85	0.87	—	
25	11	3.5	59	197	0.85	0.87	—	
27.5	12	3.5	59	197	0.85	0.87	—	
30	CHANGE	PORTS					224.16	
30	B 1	2.5	61	200	0.74	0.75	224.11	10:32
32.5	2	3.5	61	200	0.78	0.80	—	
35	3	4.5	61	201	0.85	0.87	—	
37.5	4	7.0	61	200	0.85	0.87		
40	5	12.0	62	200	0.90	~~0.90~~	0.92	
42.5	6	17.0	62	200	0.88	0.89		
AVERAGE/NET			58	198		.84	24.01	

LEAK RATES:
Start @ 0.02 @ 15"
End @ 0.02 @ 22"
Pitot: Start OK-
A 2.4 B 1.8
End
A 3.3 B 3.0

SETUP:
g 1.87
t_m 75
% H_2O 10
NOZZLE .190
C 0.94
t_s 200
Theo. Pitot 1.80

NOTES:

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT GP DATE 10/25/88

LOCATION Woodland, Me. SOURCE ESP Inlet

TEST TEAM RW, CW RUN # 1-I

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
45	B7	21.0	62	148	0.77	0.78		
47.5	8	END	Run	-	High	Vac.	232.95	END Run
~~50~~	9							
~~52.5~~	10							
55	11							
~~57.5~~	12							
60	END	Run	-					

P_{bar} _____

P_s _____

MODULE _____

FILTER _____

NOZZLE _____

PITOT _____

METHOD _____

LEAK RATES:
Start @ _____
End @ _____
Pitot:
Start
A ____ B ____
End
A ____ B ____

SETUP:
g _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_s _____
Theo. Pitot _____

AVERAGE/NET

NOTES:

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT G.P. DATE 10/25/86

LOCATION Woodland Me. SOURCE ESP Inlet

TEST TEAM RW, CW RUN # 2-I

P_{bar} 28.76

P_g +2.6

MODULE RW-2

FILTER B520

NOZZLE 0.130

PITOT #72

METHOD 5

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
1:00								
00	A1	1	57	192	0.86	0.20		233.77
02.5	2	1	57	192	0.86	0.20		
05	3	1	57	194	0.83	0.19		
07.5	4	1	57	194	0.83	0.19		
10	5	1	57	195	0.86	0.20		
12.5	6	1	58	196	0.86	0.20		
15	7	1	59	197	0.86	0.20		
17.5	8	1	59	197	0.86	0.20		
20	9	1	59	196	0.86	0.20		
22.5	10	1	60	196	0.83	0.19		
25	11	1.5	60	197	0.83	0.19		
27.5	12	1.5	61	197	0.83	0.19		
30	CHANGE	PORTS					241.44	
30	B1	1.5	63	197	0.78	0.18	241.44	1:32
32.5	2	2	63	197	0.86	0.20		
35	3	2	64	196	0.85	0.20		
37.5	4	2	64	195	0.83	0.19		
40	5	2	64	195	0.83	0.19		
42.5	6	2	64	194	0.83	0.19		
AVERAGE/NET			61	196		.19	14.68	

NOTES:

LEAK RATES:
Start @ 0.02 @ 15"
End @ 0.015 @ 10"
Pitot:
Start
A 3.1 B 2.9
End
A 2.7 B 3.3

SETUP:
E
t_m
% H_2O
NOZZLE
C
t_s
Theo. Pitot
8.0

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT G.P. DATE 10/25/88

LOCATION Woodland, Mo. SOURCE ESP Inlet

TEST TEAM RW, CW RUN # 2-I

P_{bar} _____

P_s _____

MODULE _____

FILTER _____

NOZZLE _____

PITOT _____

METHOD _____

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
45	B7	2.0	64	195	0.86	0.20		
47.5	8	7.0	65	197	0.83	0.19		
50	9	2.5	65	197	0.85	0.20		
52.5	10	2.5	65	198	0.75	0.17		
55	11	2.5	66	195	0.61	0.14		
57.5	12	2.5	65	194	0.61	0.14		
60	END	RUN.					248.76	
AVERAGE/NET								

LEAK RATES:
Start @ _____
End @ _____
Pitot:
Start
A____ B____
End
A____ B____

SETUP:
Δ _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_s _____
Theo. Pitot _____

NOTES:

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT G.P. DATE 10/25/88

LOCATION Woodland, Me SOURCE ESP Inlet

TEST TEAM BW, CW RUN # 3-I

P_{bar} 28.76

P_g +2.6

MODULE DGM-2

FILTER B521

NOZZLE 0.130

PITOT 71

METHOD 5

TIME 4:04	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
00	A1	1.5	66	193	0.86	0.20	250.08	start Rm.
02.5	2	1.5	65	191	0.83	0.19		
05	3	1.5	65	180	0.81	0.19		
07.5	4	2.0	65	179	0.83	0.19		
10	5	2.0	65	178	0.83	0.19		
12.5	6	2.0	66	201	0.83	0.19		
15.	7	2.0	66	205	0.86	0.20		
17.5	8	2.0	67	206	0.87	0.20		
20	9	2.0	67	206	0.83	0.19		
22.5	10	2.0	68	186	0.85	0.20		
25	11	2.5	68	182	0.87	0.20		
27.5	12	2.5	68	180	0.83	0.19		
30	CHANGE PORTS						257.87	
30	B1	1.5	68	195	0.73	0.17	257.87	4:41.
32.5	2	1.5	68	200	0.76	0.18		
35	3	1.5	68	200	0.76	0.18		
37.5	4	1.5	67	199	0.73	0.17		
40	5	2.0	68	199	0.83	0.19		
42.5	6		67	194	0.79	0.18		
AVERAGE/NET			67	194		.32	15.01	

NOTES:

LEAK RATES:
Start @ 0.015 @ 12"
End @ 0.015 @ 7"
Pitot:
Start
A 3.2 B 3.0
End
A 2.8 B 3.1

SETUP:
E _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_s _____
Theo. Pitot _____

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT G.P. DATE 10/25/86

LOCATION Woodland, Me. SOURCE ESP - Inlet

TEST TEAM RW, CW RUN # 3-I

TIME	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
45	B 7	2.0	68	199	0.79	0.18		
47.5	8	2.0	68	197	0.79	0.18		
50	9	2.0	68	196	0.71	0.16		
52.5	10	2.0	68	196	0.71	0.16		
55	11	2.0	68	196	0.65	0.15		
57.5	12	2.0	68	196	0.60	0.14		
60	END RUN						265.09	
AVERAGE/NET								

NOTES:

P_{bar} _____

P_s _____

MODULE _____

FILTER _____

NOZZLE _____

PITOT _____

METHOD _____

LEAK RATES:
Start @ _____
End @ _____
Pitot:
Start
A _____ B _____
End
A _____ B _____

SETUP:
θ _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_s _____
Theo. Pitot _____

ANALYTICAL TESTING CONSULTANTS, INC.
Kannapolis, N. C. Atlanta, Ga.

MODULE SAMPLING DATA SHEET

CLIENT G.P. DATE 10/25/88

LOCATION Woodland Mo. SOURCE ESP Inlet

TEST TEAM RW, CW RUN # 4-I

P_{bar} _____

P_g _____

MODULE RW-2

FILTER B523

NOZZLE 0.130

PITOT 73

METHOD 5

TIME 8:10 start	POINT	LINE VAC	t_m °F	t_s °F	V_p H_2O	P_m H_2O	V_m ft^3	REMARKS
00	A1	2.0	54	200	1.00	0.23	274.26	START Run
02.5	2	2.0	54	199	0.98	0.22		
05	3	2.0	55	198	0.96	0.22		
07.5	4	2.0	55	199	0.95	0.22		
10	5	2.0	55	199	0.95	0.22		
12.5	6	2.5	55	199	0.95	0.22		
15	7	2.5	56	200	0.95	0.22		
17.5	8	2.5	56	199	0.91	0.21		
20	9	2.5	57	179	0.88	0.20		
22.5	10	2.5	57	176	0.88	0.20		
25	11	2.0	58	175	0.75	0.18		
27.5	12	2.0	59	174	0.75	0.18		
30	CHANGE		PORTS				282.07	
30	B1						282.07	
32.5	2							
35	3							
37.5	4							
40	5							
42.5	6							
AVERAGE/NET			56	191		.21	7.81	

LEAK RATES:
Start @
.002 @ 9"
End @
_____

Pitot:
Start
A 3.1 B 2.6

End
A 3.3 B 3.1

SETUP:
g _____
t_m _____
% H_2O _____
NOZZLE _____
C _____
t_m _____
Theo. Pitot
_____

NOTES:

VOLATILE ORGANIC CARBON

FACILITY G.F. SAMPLE LOCATION ESP - Inlet

LOCATION Woodland, Me. OPERATOR Wilkes

DATE 10/25/88 RUN NUMBER 1-I

TANK NUMBER 4T42 TRAP # DV SAMPLE # 1-I

TANK VACUUM inches Hg		BAROMETRIC PRESSURE IN. Hg	AMBIENT TEMPERATURE °F
PRETEST (Manometer) 29.3	(Gauge) 29	28.76	52°
POST TEST (Manometer) 2.9	(GAUGE) 2.0	29.07	48°

LEAK RATE, IN. Hg/5 min.:	TANK	TRAP HALF
PRETEST	0	0
9:46 POST TEST	0	0

TIME CLOCK/SAMPLE	GAUGE VACUUM In. Hg	FLOWMETER SETTING	COMMENTS
00	29	50	Start Run
05	25	50	
10	23	50	
15	20	50	
20	18	50	
25	16	40	Change flow to 40
30	14	40	
35	12	40	
40	10	40	Change flow to 30
45	8	30	
50	7	30	
55	4	30	
60	20	30	END RUN

VOLATILE ORGANIC CARBON

FACILITY G.P. SAMPLE LOCATION ESP. Inlet

LOCATION Woodland, Me. OPERATOR Wilkes

DATE 10/25/88 RUN NUMBER 2-I

TANK NUMBER 744 (4T20) TRAP # EZ SAMPLE # 2-I

	TANK VACUUM inches Hg		BAROMETRIC PRESSURE IN. Hg	AMBIENT TEMPERATURE °F
PRETEST (Manometer)	29.3	(Gauge) 29	28.76	52°
POST TEST (Manometer)	10.0	(GAUGE) 9.0	29.07	48°

LEAK RATE, IN. Hg/5 min.:	TANK	TRAP HALF
PRETEST	0	0
12:15 POST TEST	0	0

TIME CLOCK/SAMPLE	GAUGE VACUUM In. Hg	FLOWMETER SETTING	COMMENTS
00	29	50	START RUN
05	27.5	50	
10	26	50	Frozen Trap STOP To Fix
15	23	50	1:49 Restart
20	21	50	:54
25	19	50	:59
30	16.5	50	:04
35	15.4	50	:09
40	13.8	50	:14
45	12.3	50	:19
50	11.0	50	:24
55	10.0	50	:29
60	9.0		END RUN

VOLATILE ORGANIC CARBON

FACILITY G.P. SAMPLE LOCATION ESP- Inlet

LOCATION Woodland, Me. OPERATOR Wilkes

DATE 10/25/88 RUN NUMBER 3-I

TANK NUMBER 745 (4T35) TRAP # NONE (FD) SAMPLE # 3-I

	TANK VACUUM inches Hg		BAROMETRIC PRESSURE IN. Hg	AMBIENT TEMPERATURE °F
PRETEST (Manometer)	29.3	(Gauge) 28	28.76	52°
POST TEST (Manometer)	7.7	(GAUGE) 7	29.07	48°

LEAK RATE, IN. Hg/5 min.:	TANK	TRAP HALF
PRETEST	0	0
POST TEST	0	0

TIME CLOCK/SAMPLE	GAUGE VACUUM In. Hg	FLOWMETER SETTING	COMMENTS
00 3:45	28	50	Start Run
05	27.5	50	
10	24.0	50	
15	22.5	50	
20	21	50	
25	19	50	
30	17	50	
35	15.5	50	
40	14.5	50	
45	13.5	50	
50	11.0	50	
55	9.5	50	
60	7.0	END RUN	

VOLATILE ORGANIC CARBON

FACILITY Georgia-Pacific
LOCATION Woodland, Me.
DATE 10/25/88
TANK NUMBER 4T31

SAMPLE LOCATION ESP Outlet
OPERATOR Rob
RUN NUMBER 1-0
TRAP # E-E
SAMPLE # 1-0

	TANK VACUUM inches Hg		BAROMETRIC PRESSURE IN. Hg	AMBIENT TEMPERATURE °F
PRETEST (Manometer)	29.3	(Gauge) 29.0	28.76	52°
POST TEST (Manometer)	1.2	(GAUGE) 2	2907	48°

LEAK RATE, IN. Hg/5 min.:	TANK	TRAP HALF
PRETEST	0	0
POST TEST	0	0

TIME CLOCK/SAMPLE	GAUGE VACUUM In. Hg	FLOWMETER SETTING	COMMENTS
9:50	29	60	Start Run
:55	26	60	
10:00	24	60	
:05	22	60	
:10	20	60	
:15	18	60	
:20	16	50	Change flow to 50
:25	11	50	
:30	9	50	
:35	7	50	
:40	5	50	
:45	3	50	
10:50	2	50	

VOLATILE ORGANIC CARBON

FACILITY Georgia - Pacific | SAMPLE LOCATION Outlet

LOCATION Woodland, Maine | OPERATOR Poole

DATE 10/25/88 | RUN NUMBER 2-0

TANK NUMBER 4T 40 | TRAP # CK | SAMPLE # 2-0

	TANK VACUUM inches Hg		BAROMETRIC PRESSURE IN. Hg.	AMBIENT TEMPERATURE °F
PRETEST (Manometer)	29.4	(Gauge) 28	28.76	52°
POST TEST (Manometer)	1.5	(GAUGE) 1.5	29.07	48°

LEAK RATE, IN. Hg/5 min.:	TANK	TRAP HALF
PRETEST	0	0
POST TEST	0	0

TIME CLOCK/SAMPLE	GAUGE VACUUM In. Hg	FLOWMETER SETTING	COMMENTS
12:15	28	40	Start Run
20	24	40	
25	21	40	
30	19	35	
35	16	35	
40	14	35	
45	12	35	Stop (to fix inlet problem)
~~55~~ 1:55	12	35	Resume
2:00	10	35	
:05	9	30	
:10	7	30	
:15	5	30	
:20	3	30	
:25	1.5	30	End Run

VOLATILE ORGANIC CARBON

FACILITY Georgia-Pacific SAMPLE LOCATION Outlet

LOCATION Woodland, Maine OPERATOR Pool

DATE 10/25/88 RUN NUMBER 3-0

TANK NUMBER 4T37 TRAP # AA SAMPLE # 3-0

	TANK VACUUM inches Hg		BAROMETRIC PRESSURE IN. Hg	AMBIENT TEMPERATURE °F
PRETEST (Manometer)	29.4	(Gauge) 29	28.76	52°
POST TEST (Manometer)	1.6	(GAUGE) 2.0	29.07	48°

LEAK RATE, IN. Hg/5 min.:	TANK	TRAP HALF
PRETEST	0	0
POST TEST	0	0

TIME CLOCK/SAMPLE	GAUGE VACUUM In. Hg	FLOWMETER SETTING	COMMENTS
3:45	29	40	Start Run
3:50	26	40	
3:55	23	40	
4:00	21	40	
:05	18.5	40	
:10	16.0	40	
:15	14.0	40	
:20	11.0	30	Adjust flow to 30
:25	8.5	30	
:30	7.0	30	
:35	5.0	30	
:40	3.5	30	
:45	2.0	30	End Run

ANALYTICAL TESTING CONSULTANTS, INC.

IMPINGER DATA SHEET

JOB Ga. Pa. LOCATION: Woodland Me UNIT: ESP Outle

80% IPA - H_2O_2 - Δ WT = 83.4 G / 3% = = 99.8 G

RUN #		DATE	CYCLONE	CONTENTS OF IMPINGERS: 1	2	3	4 (cc)	TOTAL CONDENSATE V_{lc} EPA	(OR V_w) WF-50	LOCATION & REMARKS
1-0	START	10/25/88		100mL	100ml	Dry	300 SiO_2			
	END	11-1-88		360	100	1	317.			
	Δ			260	0	1	17.	278.	ml	
2-0	START	10/25/88		100mL	100ml	Dry	300 SiO_2			
	END	11-1-88		370	100	1	309.1			
	Δ			270	0	1	9.2	280.2	ml	
3-0	START	10/25/88		100ML	100ML	Dry	300 SiO_2			
	END	11/1/88		340	100	0	315.			
	Δ			240	0	0	15.	255.	ml	
	START									
	END									
	Δ								ml	
	START									
	END									
	Δ								ml	

Data by P Whitehurst Approved by _____

(11)

ANALYTICAL TESTING CONSULTANTS, INC.

IMPINGER DATA SHEET

JOB Georgia-Pacific LOCATION Woodland, Me. UNIT ESP Inlet

RUN #		DATE	CYCLONE	CONTENTS OF IMPINGERS 1	2	3	4 (cc)	TOTAL CONDENSATE V_{lc} EPA	(OR V_w) WP-50	LOCATION & REMARKS
1-I	START	10/25/88		100 ml $NaHSO_3$	100 ml $NaHSO_3$	DRY	300g SiO_2			
	END			120	114	0	309			
	Δ			20	14	0	9	43	ml	
2-I	START	10/25/88		100 ml $NaHSO_3$	100 ml $NaHSO_3$	DRY	300g SiO_2			
	END			116	110	0	315			
	Δ			16	10	0	15	41	ml	
3-I	START	10/25/88		100 ml $NaHSO_3$	100 ml $NaHSO_3$	DRY	300g SiO_2			
	END			123	107	0	317			
	Δ			23	7	0	17	47	ml	
	START									
	END									
	Δ								ml	
	START									
	END									
	Δ								ml	

80% IPA - Δwt = 83.4 g
3% H_2O_2 - " = 99.8 g

Data by UK Pool Approved by _____

(11)

ANALYTICAL TESTING CONSULTANTS, INC.

IMPINGER DATA SHEET

JOB C.P. LOCATION Woodland Me UNIT ESP-Inlet Outlet

80% IPA - Δwt = 84.4 g
3% H_2O_2 - " = 68.8 g

RUN #		DATE	CYCLONE	CONTENTS OF IMPINGERS 1	2	3	4 (cc)	TOTAL CONDENSATE V_{lc} EPA	(OR V_w) WF-50	LOCATION & REMARKS
U-I	START	10/25/88		100ml	100ml	Dry	300g Si O_2			
	END	11/1/88		110	100	2	306.5			
	Δ			10	0	2	6.5	18.5	ml	
4-O	START	10/25/88		100ml	100ml	Dry	300g Si O_2			
	END	11/1/88		174	101	1	315.2			
	Δ			74	1	1	15.2	91.2	ml	
	START									
	END									
	Δ								ml	
	START									
	END									
	Δ								ml	
	START									
	END									
	Δ								ml	

Data by [illegible] Approved by _____

11

ANALYTICAL TESTING CONSULTANTS, INC.

TEMPERATURE DATA

JOB Ga. Pacific LOCATION Woodland Mfg. UNIT E.S.P Outlet

DATE 10/25/88 MADE BY [signature] CHECKED BY _____

Run # 1-0				Run # 2-0				Run # 3-0			
Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.	Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.	Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.
A1	Hot	270°	52°	A1	Good	250°	52°	A1	Good	270°	60°
2		270°	52°	2		255°	54°	2		270°	60°
3		270°	52°	3		255°	54°	3		270°	60°
4		270°	54°	4		275°	46°	4		275°	60°
5		275°	54°	5		275°	46°	5		275°	62°
B1		275°	54°	B1		275°	44°	B1		275°	62°
2		275°	56°	2		270°	44°	2		275°	62°
3		275°	56°	3		270°	44°	3		270°	64°
4		275°	59°	4		265°	44°	4		270°	64°
5		275°	60°	5		265°	50°	5		265°	64°
C1		275°	62°	C1		265°	50°	C1		240	64°
2		275°	64°	2		265°	50°	2		240	64°
3		270°	64°	3		250°	50°	3		230°	64°
4		265°	64°	4		250°	48°	4		230°	64°
5		265°	64°	5		250°	48°	5		250°	64°
01		250°	64°	01		250°	54°	01		265°	64°
2		250°	66°	2		240°	54°	2		265°	62°
3		250°	66°	3		240°	54°	3		265°	62°
4		250°	66°	4		240°	54°	4		260°	62°
5		250°	66°	5		240°	54°	5		260°	62°

1)

ANALYTICAL TESTING CONSULTANTS, INC.

TEMPERATURE DATA

JOB Ga. Pacific LOCATION Woodland, Me. UNIT ESP Outlet

DATE 10/25/88 MADE BY [illegible] CHECKED BY _____

Run # 4-0				Run #				Run #			
Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.	Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.	Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.
A1	Hot	270°	42°								
2		270°	42°								
3		265°	42°								
4		260°	40°								
5		260°	40°								
B1		265°	40°								
2		265°	42°								
3		265°	42°								
4		265°	42°								
5		265°	44°								

ANALYTICAL TESTING CONSULTANTS, INC.

TEMPERATURE DATA

JOB G.P. LOCATION Woodland, Me. UNIT ESP Inlet

DATE 10/25/88 MADE BY _____ CHECKED BY _____

Run # 1-I				Run # 2-I				Run # 3-I			
Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.	Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.	Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.
A1	OK	245	61	A1	245	59		A1	245	57	
2		250	61	2	250	59		2	250	57	
3		250	61	3	255	59		3	250	58	
4		250	61	4	255	60		4	250	58	
5		250	61	5	260	60		5	255	58	
6		255	61	6	260	60		6	255	58	
7		250	61	7	260	60		7	255	58	
8		255	62	8	260	60		8	255	58	
9		260	62	9	255	61		9	260	58	
10		265	62	10	260	61		10	260	58	
11		265	62	11	260	61		11	260	59	
12		260	62	12	260	61		12	260	59	
B1	OK	265	62	B1	260	61		B1	260	60	
2		265	62	2	255	61		2	260	60	
3		260	62	3	255	62		3	260	60	
4		260	62	4	260	62		4	255	60	
5		260	62	5	260	62		5	255	59	
6		265	63	6	265	62		6	255	59	
7		260	63	7	265	62		7	255	59	
8		260	63	8	265	62		8	255	59	
9		260	63	9	270	63		9	250	59	
10		260	63	10	270	63		10	250	59	
11		255	64	11	270	63		11	250	59	
12		255	64	12	270	63		12	250	59	

TEMPERATURE DATA

JOB G.P. LOCATION Woodland Me UNIT ESP Inlet

DATE 10/25/64 MADE BY PJ CHECKED BY

Run # 4-1				Run #				Run #			
Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.	Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.	Time or Pt.	Probe Temp. F.	"Hot Box" Temp. F.	Exit Gas Temp. F.
1	6K	230°	42°								
2		235°	42°								
3		245°	42°								
4		245°	42°								
5		245°	42°								
6		250°	42°								
7		250°	42°								
8		250°	42°								
9		250°	40°								
10		250°	40								
11		250	40°								
12		255	40°								
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/88 ANALYST: Wilke

CLIENT: GP Woodland SOURCE: ESP Inlet

INSTRUMENT: Fyrite CAL. GASES:

Type:	%	Inst. Reading

_____ Integrated bag ✓ Individual point readings

RUN/POINT Run 1-I	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
A 2	17.0	3.0				
4	17.5	2.5				
6	16.5	3.5				
8	16.5	3.0				
10	16.5	3.5				
B 2	15.5	4.5				
4	15.5	4.6				
6	16.0	4.0				
8						
10					79.7	
Avg.	16.4	3.9	20.3			

ATC 13-A

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/88 ANALYST: Wilkes

CLIENT: GP Woodland SOURCE: ESP Inlet

INSTRUMENT: Fyrite CAL. GASES:

Type:	%	Inst. Reading

_____Integrated bag X Individual point readings

RUN/POINT 2I	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
A2	17.0	3				
4	16.5	3.5				
6	16.5	3.5				
8	16.5	3.5				
10	16.0	4.5				
B2	16.5	3.5				
4	16.5	3.5				
6	16.0	4.5				
8	16.0	4.5				
10	15.5	5.5			79.9	
Avg.	16.1	4.0				

ATC 13-A

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/88 ANALYST: Wilke

CLIENT: G P Woodland SOURCE: ESP Inlet

INSTRUMENT: Fyrite CAL. GASES:

Type:	%	Inst. Reading

_____Integrated bag X Individual point readings

RUN/POINT Run 4I	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
Av	15.5	4.5				
4	15.5	5.0				
6	15.5	5.0				
8	16.0	4.5				
10	15.5	5.0				
Avg.	15.6	4.8				

ATC 13-A

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/88 ANALYST: K. Poole

CLIENT: GP SOURCE: ESP - Outlet

INSTRUMENT: 611 CAL. GASES:

Type:	%	Inst. Reading
Ambient	20.95	20.9

_____ Integrated bag __X__ Individual point readings

Run 1-0

RUN/POINT	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
1A	19.0	2.5				
2A	18.4	2.5				
3A	17.9	2.7				
4A	17.3	2.7				
5A	17.4	2.7				
2B	17.5	2.4				
2B	17.5	2.4				
3B	17.3	2.5				
4B	17.6	2.5				
5B	17.4	2.3				

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/88 ANALYST: K Poole

CLIENT: GP SOURCE: ESP - Outlet

INSTRUMENT: 611 CAL. GASES:

Type:	%	Inst. Reading
Ambient	20.95	20.9

_____ Integrated bag

__X__ Individual point readings

RUN/POINT Run 1-0	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
1C	17.8	2.3				
2C	17.6	2.5				
3C	18.4	1.8				
4C	17.3	2.5				
5C	17.7	2.2				
1D	18.2	2.0				
2D	18.4	2.0				
3D	18.2	2.1				
4D	18.5	2.1				
5D	17.9	2.2				
Avg.	17.9	2.3			79.8	

ATC 13-A

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/99 ANALYST: K. Poole

CLIENT: G.P. SOURCE: ESP - Outlet

INSTRUMENT: 611 CAL. GASES:

Type:	%	Inst. Reading
Ambient	20.95	20.9

_____ Integrated bag _X_ Individual point readings

Run 2 - 0

RUN/POINT	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
1A	17.6	2.4				
2A	17.8	2.3				
3A	19.3	2.6				
4A	17.3	2.6				
5A	17.5	2.4				
1B	17.3	2.5				
2B	17.4	2.5				
3B	17.2	2.7				
4B	17.1	2.8				
5B	17.4	2.6				

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/89 ANALYST: K Poole

CLIENT: GP SOURCE: ESP. Outlet

INSTRUMENT: 611 CAL. GASES:

Type:	%	Inst. Reading
Ambient	2295	20.9

____ Integrated bag __X__ Individual point readings

RUN/POINT Run 2-0	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
1C	17.4	2.7				
2C	17.2	2.6				
3C	17.0	2.8				
4C	17.4	2.7				
5C	17.7	2.4				
1D	17.5	2.3				
2P	17.4	2.4				
3P	17.6	2.5				
4D	17.4	2.6				
5D	17.4	2.4				
Avg.	17.4	2.6			80	

ATC 13-A

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/98

ANALYST: K. Poole

CLIENT: G.P.

SOURCE: ESP - Outlet

INSTRUMENT: 611

CAL. GASES:

Type:	%	Inst. Reading
Ambient	20.95	20.9

_____ Integrated bag

X Individual point readings

Run 3-0

RUN/POINT	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
1A	17.4	2.6				
2A	17.2	2.6				
3A	17.3	2.4				
4A	17.3	2.7				
5A	17.3	2.8				
1B	17.6	2.3				
2B	17.6	2.3				
3B	17.4	2.5				
4B	17.2	2.6				
5B	17.3	2.6				

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/88

ANALYST: Keith Poole

CLIENT: G-P Wallula

SOURCE: ESP Outlet

INSTRUMENT: PCA 611

CAL. GASES:

Type:	%	Inst. Reading
Ambient	20.95	20.9

_____ Integrated bag

__X__ Individual point readings

RUN/POINT 3-0	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
1C	17.3	2.3				
2C	17.3	2.5				
3C	17.2	2.4				
4C	17.8	2.4				
5C	17.6	2.5				
1D	17.5	2.4				
2D	17.5	2.5				
3D	17.4	2.5				
4D	17.6	2.6				
5D	17.5	2.5				
Avg.	17.4	2.5			80.1	

ATC 13-A

ANALYTICAL TESTING CONSULTANTS, INC.
GAS ANALYSIS DATA

DATE: 10/25/88 ANALYST: K Pod

CLIENT: Ga Pacific SOURCE: ESP - Outlet

INSTRUMENT: PCA 611 CAL. GASES:

Type:	%	Inst. Reading
Ambient	20.95	20.9

_____Integrated bag X Individual point readings

RUN/POINT Run 4-0	O_2 %	CO_2 %	CO ppm	SO_2 ppm	N_2 % by dif	REMARK
1A	17.0	2.8				
2A	17.4	2.6				
3A	17.4	2.5				
4A	17.4	2.7				
5A	17.6	2.5				
1B	17.6	2.5				
2B	17.5	2.5				
3B	17.6	2.7				
4B	17.4	2.4				
5B	17.4	2.4				
Avg.	17.4	2.6				

ATC 13-A

ANALYTICAL TESTING CONSULTANTS, INC.

CHAIN OF CUSTODY FORM

Plant Georgia-Pacific - Woodland Me,

Run No. 1, 2, 3.

Sampling Location ESP Outlet

Filter No. BS16, BS15 BS18

Test Method

☑ EPA 5 ☐ EPA 6

☐ EPA 6 ☐ ____

☐ EPA 7 ☐ ____

Container No.	Contents	Sample Recovered by	Remarks
Run #1 BS15 Run #2 BS18 Run #3 BS16	Filter	KP	
1,2,3 - Dry Catch Wash	Probe, nozzle and cyclone washings	C.W R.W.	
1,2,3 - Wet Catch Solution	Impinger solutions	D. Mc.	
1,2,3 - Wet Catch Wash	Impinger washings	D. Mc	
Run, 1, 2, 3.	Silica gel	KP	
	Solvent blank	KP	

Note: Liquid levels to be marked with grease pencil on all sample containers and to be checked when delivered to lab.

Delivered to lab by: D. Mc Date 10-28-88

Received in lab by: K. P. Date 10.28.88

Analysis completed by K. P. Date 11-2-88

ANALYTICAL TESTING CONSULTANTS, INC.

CHAIN OF CUSTODY FORM

Plant Georgia-Pacific, Woodland, Me.

Run No. 1I, 2I, 3I, 4I, 4-O

Sampling Location ESP Inlet & Outlet

Filter No. B522, B519, B520, B521, B523

Test Method

☑ EPA 5 ☐ EPA

☐ EPA 6 ☐ ____

☐ EPA 7 ☐ ____

Container No.	Contents	Sample Recovered by	Remarks
Run 4-O B522 Run 1-I B519 Run 2-I B520 Run 3-I B521	Run 4-I - B523 Filter	KP	
1-I, 2I 3I, 4I-C-Dry Catch Wash	Probe, nozzle and cyclone washings	C.W. R.W.	
1I, 2I, 3I 4I, 4O-Wet Catch Solution	Impinger solutions	DMc	
1I, 2I, 3I, 4I, 4C-Wet Catch Wash	Impinger washings	DMc	
Runs 1I, 2I, 3I 4I, 4O	Silica gel	KP	
	Solvent blank	KP	

Note: Liquid levels to be marked with grease pencil on all sample containers and to be checked when delivered to lab.

Delivered to lab by: DMc Date 10-28-88

Received in lab by: K.P. Date 10-28-88

Analysis completed by K.P. Date 11-2-88

SOURCE TEST SURVEY

SOURCE NAME: C-P Woodland Chip Dryer Exhaust
LOCATION: Wood Land Maine
DATE Oct 24 1988 OBSERVER'S NAME: Keith Boice

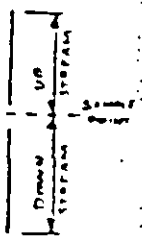
PURPOSE OF TEST: Compliance
TESTING DONE BY: ATC INC.
LAB ANALYSIS DONE BY:

COMPANY CONTACT: Larson Harsey TELEPHONE
CONTROL EQUIPMENT OPERATING: ESP
OPACITY READING MADE: ____ YES X NO

UNIT/PROCESS NAME:
RATED CAPACITY:
TYPE FUEL USED: Wood

APPROX. PROCESS RATE:
METHOD OF DETERMINING PROCESS RATE:
STACK HEIGHT: 100
INDIVIDUAL STACK ✓ COMMON STACK
DIAMETER: (IF ROUND) 64" (IF RECTANGULAR) WIDTH LENGHT

I. SAMPLING POINT LOCATION



A. DISTANCE DOWNSTREAM FROM ANY FLOW DISTURBANCE:
NATURE OF DISTURBANCE 30' Branching
(BEND, CONTRACTION, EXPANSION, FAN, BAFFLES, ETC.)
B. DISTANCE UPSTREAM FROM ANY FLOW DISTRUBANCE:
NATURE OF DISTURBANCE 25'
(BEND, STACK EXIT, CONTRACTION, FAN, BAFFLES, EXPANSION. ETC.
C. NUMBER OF PORTS IN STACK: 4
D. NUMBER OF POINTS SAMPLED PER PORT: 5

II. STACK GAS

A. STACK TEMPERATURE: 140 °F
B. ORSAT ANALYSIS:
GRAB CONTINUOUS NUMBER OF INTEGRATED SAMPLES
C. PRELIMINARY ΔP: MIN. .62 MAX. 1.1

III. PARTICULATE TEST

A. SAMPLING TRAIN:
1. TEST METHOD: EPA METHOD 5 ✓ ASME PTC 21/27
OTHER (DISCRIBE)
2. TYPE FILTERS
3. PROBE IDENTIFICATION
4. METER CALIBRATION FACTOR 1.0
5. ORIFICE Δ H @ FACTOR 1.6
6. DATE OF LAST CALIBRATION CHECK
a. ORIFICE METER d. DRY GAS METER
b. TEMPERATURE DEVICES e. PITOT TUBE
c. NOZZLE DIAMETER f. OTHER

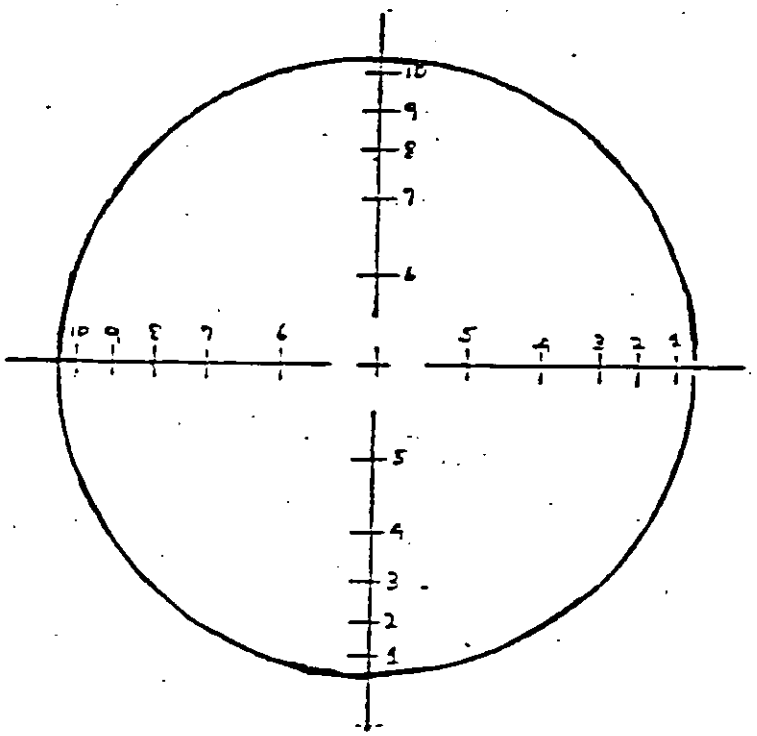
ANALYTICAL TESTING CONSULTANTS, INC.

JOB Georgia-Pacific LOCATION Woodland, Me. DATE 10/24/81

UNIT ESP Outlet MADE BY Poole CHECKED BY

Description EQUAL AREA CALCULATIONS

ROUND DUCT - TEN POINT TRAVERSE PER DIAMETER



Stack I.D.= 64 In.		
Point No.	% of Diameter	Distance (Inches)
1	2.5	1.6
2	8.2	5.25
3	14.6	9.34
4	22.6	14.46
5	34.2	21.89
6	65.8	42.11
7	77.4	49.54
8	85.4	54.66
9	91.8	58.75
10	97.5	62.4

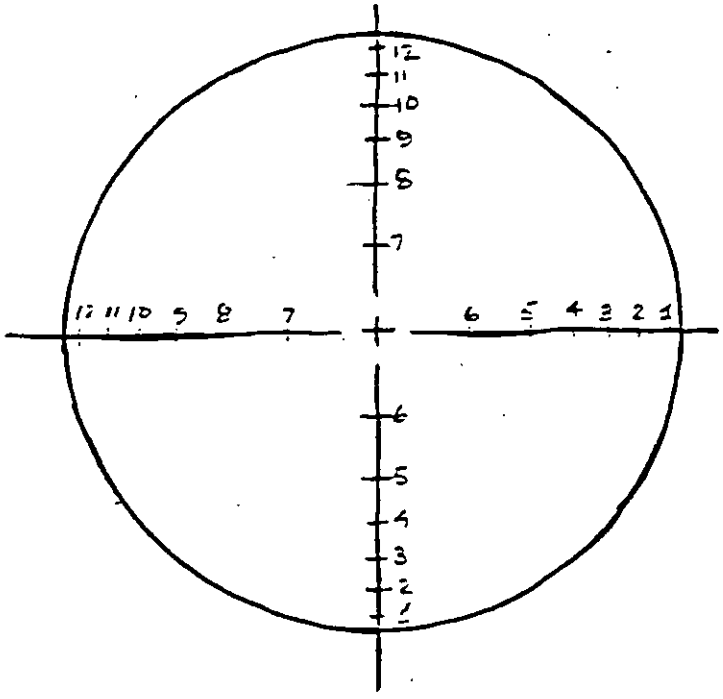
ANALYTICAL TESTING CONSULTANTS, INC.

JOB Ga. Pac. Fix LOCATION Woodland, Me DATE 10/24/86

UNIT ESP ~~Exit~~ Inlet MADE BY RNJ CHECKED BY _____

Description EQUAL AREA CALCULATIONS
ROUND DUCT - TWELVE POINT TRAVERSE PER DIAMETER

2" Port Depth



STACK I.D. = 68 IN.		
POINT NO.	% OF DIAMETER	DISTANCE (INCHES)
1	2.1	1.43
2	6.7	4.56
3	11.8	8.02
4	17.7	12.04
5	25.0	17.00
6	35.5	24.14
7	64.5	43.86
8	75.0	51.00
9	82.5	56.10
10	88.2	59.98
11	93.3	63.44
12	97.9	66.57

d

ANALYTICAL TESTING CONSULTANTS, INC. Form # 15

TRAVERSE DATA & FLOW COMPUTATION

Customer G P Test No. _____ Test Team DM

Location Woodland ME. Date Oct 24 1988 KP

Unit CHP Dryer Exhaust Barometer 29.06 in. Hg.

Dry Bulb _____ F.

Wet Bulb _____ F.

Time 4.30 PM

SP -1.1 in WG / in Hg

Pitot Type S

Fs for Pitot .84

64" ID STACK

SMPL POINT	Vp inches	$\sqrt{Vp}$	Temp. ts F.	ΔP 0°REF.	∝ #
A 1	.62	0.787	140	0	
2	.75	0.866	141	5	
3	.88	0.938	141	0	
4	.92	0.959	142	0	
5	.95	0.975	142	0	
B1	.64	0.800	140	0	
2	.88	0.938	140	0	
3	.98	0.990	140	0	
4	1.0	1.000	141	0	
5	1.1	1.049	141	0	
C1	.68	0.825	138	5	
2	.83	0.911	139	0	
3	.89	0.943	140	0	
4	.94	0.970	140	0	
5	1.0	1.000	140	0	
D1	.71	0.843	140	0	
2	.90	0.894	140	0	
3	.92	0.959	141	0	
4	.94	0.970	141	0	
5	1.1	1.049	141	0	
		18.666			
		[illegible]			
AVERAGE		0.933	140.5	0.5	

ρ_s = Spec. Wt. of Air = .075 lbs/ft^3

#∝ = angle in degree of to yield 0ΔP

Sketch (if applicable)

1. ts (Avg.) = 140.5 + 460 = 600.5 T_s (Rankin)

2. Duct Area = A = 22.34 = [illegible] Sq.Ft.

3. P_s = Barometer + SP = 28.98 in. Hg.

4. G.D. = $\rho_s(\frac{530}{T_s})(\frac{P_s}{29.92})$ = 0.0641 lbs/cu.

5. K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ = 4330.4

6. V = Velocity = K F_s $\sqrt{V_p}$ Avg. = 3,393.8 ft/mi

7. VOLUME average = AxV = 75,818 ACF

8. SCFM = Volume $(\frac{530}{T_s})(\frac{P_s}{29.92})$ = 64,871.9 SCFM

ANALYTICAL TESTING CONSULTANTS, INC. Form # 15

TRAVERSE DATA & FLOW COMPUTATION

Customer GP Test No. 01 Test Team RW CW

Location Woodland ME. Date 10/24/88

Unit ESP Inlet Barometer 29.06 in. Hg.

Dry Bulb _____ F.

Wet Bulb _____ F.

Time 4.35 AM PM

SP +2.6 in WG in Hg

Pitot Type SPEC

Fs for Pitot 0.84

68" ϕ

SMPL POINT	Vp inches	$\sqrt{Vp}$	Temp. ts F.	Δ P 0°REF.	∝ #
A1	0.55		188		
2	0.75		193		
3	0.78		195		
4	0.83		198		
5	0.85		201		
6	0.92		203		
7	0.88		204		
8	0.80		206		
9	0.75		207		
10	0.74		207		
11	0.73		207		
12	0.72		206		
B1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
AVERAGE					

ρ_s = Spec. Wt. of Air = .075 lbs/ft^3

#∝ = angle in degree of to yield 0ΔP

Sketch (if applicable)

1. t_s (Avg.) = _____ + 460 = _____ T_s (Rankin)

2. Duct Area = A = _____ = _____ Sq.Ft.

3. P_s = Barometer ± SP = _____ in. Hg.

4. G.D. = $\rho_s \left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ = _____ lbs/cu.

5. K = Constant = $\frac{1096.5}{\sqrt{G.D.}}$ = _____

6. V = Velocity = K F_s $\sqrt{V_p}$ Avg. _____ ft/mi

7. VOLUME average = AxV = _____ ACF

8. SCFM = Volume $\left(\frac{530}{T_s}\right)\left(\frac{P_s}{29.92}\right)$ _____ SCFM

Georgia-Pacific/Woodland, Me.
Balance Check - Autocal

WASH

Run #	Beaker #	Final Wt.	Initial Wt.	Net
1-0	2	79.8869	79.8810	.0059
2-0	4	82.3504	82.3433	.0071
3-0	6	77.1396	77.1313	.0083
~~4-0~~ BLANK	9	76.3552	76.3550	.0002

FILTERS

Run #	Filter #	Final	Initial	Net
1-0	B515	.3602	.3459	.0143
2-0	B518	.3613	3478	.0135
3-0	B516	.3640	.3482	0158

Run	Total Net Gain (Filter)	Wash	Total Wt. Gain
1-0	.0143	.0059	.0202
2-0	.0135	.0071	.0206
3-0	.0158	.0083	.0241

W. Keith Pardo
11/2/88

14

Georgia-Pacific, Woodland, Me.

Back Half Evaporations

Balance Ck- Autocal

Run #	Beaker	Alq. (ml)	Final	Initial	Net
1-I-1st	1	50	75.7312	75.5912	.1400
1-I-2nd	2	50	83.1221	82.9515	.1706
1-O-1st	3	50	79.5454	79.3560	.1894
1-O-2nd	4	50	71.8104	71.8004	.0100
2-I-1st	5	60	79.1855	78.9023	.2832
2-I-2nd	6	25	76.4546	76.3415	.1131
2-O-1st	7	50	82.7841	82.6798	.1043
2-O-2nd	8	50	76.7060	76.5042	.2018
3-I-1st	9	50	81.6204	81.3783	.2421
3-I-2nd	10	50	82.1636	81.8864	.2772
3-O-1st	11	50	66.1229	66.0027	.1202
3-O-2nd	12	25	77.0985	76.9583	.1402
4-I-1st	13	50	77.1998	76.8973	.3025
4-I-2nd	14	50	82.7932	82.5848	.2084
4-O-1st	15	50	78.5438	78.3183	.2255
4-O-2nd	16	50	77.8716	77.6807	.1909
Blank	17	50	74.6279	74.2400	* .0002

* Corrected for $NaHSO_3$

W Keith Park
10/31/88

Georgia-Pacific
Woodland, Me.

FRONT HALF EVAPORATIONS

BALANCE CK-AUTOCAL

RUN #	BEAKER	FINAL	INITIAL	NET
1-I	1	76.6328	76.5978	.0350
1-O	2	79.8869	79.8810	.0059
2-I	3	82.7868	82.7729	.0139
2-O	4	82.3504	82.3433	.0071
3-I	5	63.4758	63.4405	.0353
3-O	6	77.1396	77.1313	.0083
4-I	7	79.4976	79.4531	.0245
4-O	8	63.3209	63.3180	.0029
BLANK	9	76.3552	76.3550	.0002

FILTERS

RUN	FILTER #	Final	initial	NET
1-I	B519	.5155	.3453	.1702
2-I	B520	.4268	.3462	.0806
3-I	B521	.4086	.3466	.0620
4-I	B523	.3875	.3447	.0428
1-O	B515	.3602	.3459	.0143
2-O	B518	.3613	.3478	.0135
3-O	B516	.3640	.3482	.0158
4-O	B522	.3536	.3443	.0093

W. L. Park 10/31/80

18

Georgia-Pacific
Woodland, Me.

Balance CK - Autocal

Front Half / Back Half Combined Weight Gains.

Run	Beaker Wt.	Filter Gain	Total
1-I	.0350	.1702	.2052
2-I	.0139	.0806	.0945
3-I	.0353	.0620	.0973
4-I	.0245	.0428	.0673
1-O	.0059	.0143	.0202
2-O	.0071	.0135	.0206
3-O	.0083	.0158	.0241
4-O	.0029	.0093	.0122

WK Peel
10/31/88

Research Triangle Laboratories, Inc.

November 3, 1988

Mr. Dan McCombs
Analytical Testing Consultants, Inc.
506 Broad Street
Kannapolis, NC 28081

Dear Mr. McCombs:

We enclose the report for the Method 25 samples analyzed November 2nd. The report consists of a summary table of results, an experimental procedure, a sample calculation, a calibration data sheet, and a set of data reports.

Note that the tank vacuum readings were set equal to the barometric pressures to avoid negative absolute pressures. Note also that the cap on the probe lead of tank EE (Sample #2) was loose.

Let us know if you have any problems. Thank you for choosing us for your Method 25 analyses.

Sincerely,

RESEARCH TRIANGLE LABORATORIES, INC.

John Y. Morimoto
Chemist

JYM

Enclosures

P.O. Box 12507 • Research Triangle Park, N.C. 27709 • 919-544-5775

Research Triangle Laboratories, Inc.

prepared for

ANALYTICAL TESTING CONSULTANTS

prepared by

RESEARCH TRIANGLE LABORATORIES, INC.

Gene Mull
Chemist

John Y. Morimoto, Ph.D.
Chemist

RTL ID #88-297
November 3, 1988

P.O. Box 12507 • Research Triangle Park, N.C. 27709 • 919-544-5775

RESEARCH TRIANGLE LABORATORIES

METHOD 25 TABLE OF RESULTS

Name: Analytical Testing Consultants ID #88-80-297 Date: 11/2/88

Sample Number	Sample Description	Concentrations (ppmC) CO+CH4	CO2	Noncondensibles	Condensibles	TGNMO	Mass Conc. (mgC/cu.m)
1	1-I	243	27578	45	668	713	355
2	1-O	102	20918	38	324	362	180
3	2-I	393	40208	58	1210	1268	632
4	2-O	69	8412	39	151	190	95
5	3-I	251	38274	89	456	546	272
6	3-O	51	10173	14	177	190	95

METHOD 25 EXPERIMENTAL PROCEDURE

Calibration

A propane calibration gas mixture of 74.7 ppm CO, 70.5 ppm CH_4, 2.10% CO_2 and 67.2 ppm propane is injected via a 1 mL sampling loop into the analyzer. The injections are repeated until three integrated areas indicate reasonable (<5%) agreement. A 1.00% CO_2 standard is run daily with the same requirement. The average daily response factors must agree within 5% of the RF(CO_2) and the RF(NMO) from the initial performance check.

Duplicate injections of the propane calibration mix are made prior to each sample analysis. Two injections of the propane mix standard are made after the final sample each day.

Response factors (average integrated area/concentration in ppmC) are calculated daily from the initial triplicate injections.

Analysis

Each trap is stored with dry ice until just prior to analysis and is flushed of CO_2 by passing zero air through it a -78 °C and via the CO_2 NDIR to the sample tank. Flushing is continued until no NDIR response is noted. The trap is baked at 200 °C with zero air flushing through the trap and via the oxidation catalyst and the NDIR into the collection vessel. Collection is continued until no NDIR response is noted. The trap is transferred to an oven set at 350 °C and baking is continued for 30 minutes. This ensures the cleanliness of the trap for a subsequent sampling. The trap is taken out of the oven and allowed to cool; it is then capped and stored for shipment.

The sample tank is analyzed by injecting an aliquot via a 1 mL sample loop into the GC column, which is held at 85 °C to elute the CO+CH_4 and then the CO_2 which is passed to the oxidation catalyst, reduction catalyst, and FID. The column is then backflushed at 195 °C to elute the organic fraction. The collection vessel is analyzed identically. In both cases, triplicate injections are made.

The sample tank is pumped for 5 minutes (to less than 5 mmHg) and air is then allowed in via a paper fiber filter; this procedure is repeated. The tank is pumped 10 minutes and allowed to stand overnight. The tank is then connected to a pressure gauge to test for leaks (maximum permissible leak rate = 10 mmHg/day). If the tank passes the leak test, it is filled with zero air to slightly greater than atmospheric pressure and stored for shipment.

Calculations

Calculations are done in accord with EPA Method 25 procedures. A sample calculation is provided using client/RTL data.

RESEARCH TRIANGLE LABORATORIES

METHOD 25 SAMPLE CALCULATION

Note: All pressure values have been converted when necessary to mm Hg and all temperature values to Kelvin.

Name: Analytical Testing Consultants ID #88-80-297 Date: 11/2/88

Sample # 1 1-I

DATA

Tank 4T42:
Volume (cu.m) = 0.004190

	Pressure (mm Hg)	Temp.(K)
Presampling	0.0	284.3
Postsampling	664.7	282.0
Final	1008.0	295.2

Trap DV

Collection Vessel:
Volume (cu.m) = 0.004551

	Pressure (mm Hg)	Temp.(K)
Final	1120.0	299.2

Calibration Data:

	CO2	Backflush
Response Factor (area units/ppmC)	195.7	205.7
Blank (ppmC)	2.0	
Blank Area (area units)		681

Areas:

CO + CH4	33,111	32,828	32,425
CO2	3,717,400	3,728,400	3,727,800
Noncondensibles	6,814	7,155	7,155
Condensibles	75,493	77,036	76,098

CALCULATIONS

Measured Concentrations, corrected for blank:

Cm(CO+CH4) = Area(CO+CH4)/RF(CO2)
= 33111 /196 = 169.2
= 32828 /196 = 167.7
= 32425 /196 = 165.7

Cm(CO2) = Area(CO2)/RF(CO2)
= 3717400 /196 = 18995.4
= 3728400 /196 = 19051.6
= 3727800 /196 = 19048.5

Cm(Noncondensibles) = [Area(Noncondensibles) - Blank Area(NMO)]/RF(NMO)
= (6814 - 681)/206 = 29.8
= (7155 - 681)/206 = 31.5
= (7155 - 681)/206 = 31.5

Cm(Condensibles) = Area(Condensibles)/RF(CO2) - Blank(CO2)
= 75493 /196 - 2.0 = 383.8
= 77036 /196 - 2.0 = 391.6
= 76098 /196 - 2.0 = 386.9

RESEARCH TRIANGLE LABORATORIES METHOD 25 SAMPLE CALCULATION

Pressure-Temperature Ratio, Q(i) = P(i)/T(i):

postsampling tank: Q(1) = 664.718 / 282.0389 = 2.356831
presampling tank: Q(2) = 0 / 284.2611 = 0
final tank: Q(3) = 1008 / 295.15 = 3.415213
final CV: Q(4) = 1120 / 299.15 = 3.743941

Volume Sampled (dscm) = 0.386 x Tank Volume x [Q(1)-Q(2)]
= 0.386 x .00419 x [2.3568 - 0.0000]
= 0.003812

Averages and % Relative Standard Deviations (%RSD) of Cm's are calculated.
(%RSD of C = %RSD of Cm)

Calculated Concentrations:

C(CO+CH4) = Q(3)/[Q(1)-Q(2)] x Cm(CO+CH4)
= 3.4152/(2.3568 - 0.0000) x 167.5 = 242.8

C(CO2) = Q(3)/[Q(1)-Q(2)] x Cm(CO2)
= 3.4152/(2.3568 - 0.0000) x 19031.9 = 27578.5

C(Noncondensibles) = Q(3)/[Q(1)-Q(2)] x Cm(Noncondensibles)
= 3.4152/(2.3568 - 0.0000) x 30.9 = 44.8

C(Condensibles)
= Volume(CV)/Volume(Tank) x Q(4)/[Q(1)-Q(2)] x Cm(Condensibles)
= 0.004551/0.004190 x 3.7439/(2.3568 - 0.0000) x 387.4 = 668.5

Total Gaseous Non-Methane Organics(TGNMO)=C(Noncondensibles)+C(Condensibles)
= 44.8 + 668.5
= 713.3

Mass Concentration = 0.498 x TGNMO
= 0.498 x 713.3 = 355.2

S A M P L E Q A / Q C D A T A

METHOD 25 CALIBRATION CHECK

5.1.1 Carrier gas and auxiliary oxygen blank (9/29/87)
$CO + CH_4 + CO_2 + NMO = 0$ ppm Requirement: <5 ppm

5.1.2 Catalyst Efficiency Check (10/1/87)
CO_2 ppmC = 10036 Requirement: (CO_2 ppmC = 10000 ± 200)

5.1.3 System Performance Check (10/1-2/87)

	Average percent Recovery (100 ± 5%)	% RSD (<2%)
50 uL Hexane	100.6%	0.2
10 uL Hexane	100.9%	0.2

5.2.1 Oxidation Catalyst Efficiency Check (10/2/87)

FID Response with Reduction Catalyst out = 0.85%
Requirement: <1% FID Response

5.2.2 Reduction Catalyst Efficiency Check (10/2-9/87)
Response factor of CO_2 with Oxidation Catalyst and Reduction Catalyst operative was 121.2% of response with Catalysts out.
Requirement: Response Factor >95%

5.2.3 Analyzer Linearity Check and NMO Calibration (Initial, 10/4-6/87).

$\overline{RF}$ Values agree within 2% Requirement: Agree within 2.5%
% RSD values for triplicates <2% Requirement: % RSD values <2%

$\frac{RF(NMO)}{RF(CO_2)} = 1.018$ Requirement: $\frac{RF(NMO)}{RF(CO_2)} = 1.0 \pm 0.1$

5.2.4 System Performance check (10/4/87)

	Measured Value	Expected Value	Requirement
Propane Mix	56.6 ppm	56.7 ppm	Expected ±5%
Hexane	54.2 ppm	51.8 ppm	Expected ±5%
Toluene	60.7 ppm	60.5 ppm	Expected ±5%
Methanol	94.2 ppm	92.7 ppm	Expected ±5%

5.3 NMO Analyzer Daily Calibration
Mixed propane gas plus high level CO_2 triplicate injections are made at the beginning of the day.

Requirement: $DRF(CO_2) = RF(CO_2) \pm 5\%$
$DRF(NMO) = RF(NMO) \pm 5\%$

RESEARCH TRIANGLE LABORATORIES

METHOD 25 DATA REPORT

Name: Analytical Testing Consultants ID #88-80-297 Date: 11/2/88

Sample # 1 1-I

TANK 4T42:
Volume (cu.m) = 0.004190

TRAP DV COLLECTION VESSEL:
Volume (cu.m) = 0.004551

	Pressure (mm Hg)	Temp.(K)		Pressure (mm Hg)	Temp.(K)
Presampling	0.0	284.3			
Postsampling	664.7	282.0			
Final	1008.0	295.2	Final	1120.0	299.2

Volume Sampled (dscm) = 0.003812

Calibration Data:

	CO2	Backflush
Response Factor (area units/ppmC)	195.7	205.7
Blank (ppmC)	2.0	
Blank Area (area units)		681

Areas:

CO + CH4	33,111	32,828	32,425
CO2	3,717,400	3,728,400	3,727,800
Noncondensibles	6,814	7,155	7,155
Condensibles	75,493	77,036	76,098

Concentrations (ppmC):		%RSD
CO + CH4	242.7803	1.0514
CO2	27578.4800	0.1661
Noncondensibles	44.8059	3.0954
Condensibles	668.4996	1.0254
TGNMO	713.3055	

(= 355.2261 mgC/cu.m)

RESEARCH TRIANGLE LABORATORIES

METHOD 25 DATA REPORT

Name: Analytical Testing Consultants ID #88-80-297 Date: 11/2/88

Sample # 2 1-O

TANK 4T31:
Volume (cu.m) = 0.004215

TRAP EE COLLECTION VESSEL:
Volume (cu.m) = 0.004551

	Pressure (mm Hg)	Temp.(K)		Pressure (mm Hg)	Temp.(K)
Presampling	0.0	284.3			
Postsampling	707.9	282.0			
Final	975.0	294.2	Final	1011.0	298.2

Volume Sampled (dscm) = 0.004084

Calibration Data:

	CO2	Backflush
Response Factor (area units/ppmC)	195.7	205.7
Blank (ppmC)	2.0	
Blank Area (area units)		681

Areas:

CO + CH4	15,260	14,890	15,050
CO2	3,063,400	3,118,200	3,118,000
Noncondensibles	6,814	6,814	6,133
Condensibles	43,871	44,216	43,609

Concentrations (ppmC):		%RSD
CO + CH4	101.6718	1.2316
CO2	20918.2900	1.0188
Noncondensibles	37.9169	6.6572
Condensibles	324.3123	0.6998
TGNMO	362.2293	

(= 180.3902 mgC/cu.m)

RESEARCH TRIANGLE LABORATORIES

METHOD 25 DATA REPORT

Name: Analytical Testing Consultants ID #88-80-297 Date: 11/2/88

Sample # 3 2-I

TANK 4T20: TRAP EZ COLLECTION VESSEL:
Volume (cu.m) = 0.004215 Volume (cu.m) = 0.004551

	Pressure (mm Hg)	Temp.(K)		Pressure (mm Hg)	Temp.(K)
Presampling	0.0	284.3			
Postsampling	484.4	282.0			
Final	1020.0	294.2	Final	1324.0	299.2

Volume Sampled (dscm) = 0.002794

Calibration Data:

	CO2	Backflush
Response Factor (area units/ppmC)	195.7	205.7
Blank (ppmC)	2.0	
Blank Area (area units)		681

Areas:

CO + CH4	38,306	37,848	38,111
CO2	3,896,600	3,895,800	3,899,000
Noncondensibles	6,133	6,473	7,155
Condensibles	82,878	87,841	85,781

Concentrations (ppmC):		%RSD
CO + CH4	392.9679	0.6034
CO2	40207.8000	0.0427
Noncondensibles	57.9716	8.8122
Condensibles	1210.1640	2.9297
TGNMO	1268.1350	

(= 631.5313 mgC/cu.m)

RESEARCH TRIANGLE LABORATORIES

METHOD 25 DATA REPORT

Name: Analytical Testing Consultants ID #88-80-297 Date: 11/2/88

Sample # 4 2-0

TANK 4T40:
Volume (cu.m) = 0.004190

	Pressure (mm Hg)	Temp.(K)
Presampling	0.0	284.3
Postsampling	700.3	282.0
Final	998.0	294.2

Volume Sampled (dscm) = 0.004016

TRAP CK

COLLECTION VESSEL:
Volume (cu.m) = 0.004551

	Pressure (mm Hg)	Temp.(K)
Final	996.0	298.2

Calibration Data:

	CO2	Backflush
Response Factor (area units/ppmC)	195.7	205.7
Blank (ppmC)	2.0	
Blank Area (area units)		681

Areas:

CO + CH4	10,043	9,718	9,756
CO2	1,207,600	1,202,300	1,204,400
Noncondensibles	6,473	6,473	6,814
Condensibles	20,813	20,646	20,312

Concentrations (ppmC):

		%RSD
CO + CH4	68.7006	1.8060
CO2	8412.2520	0.2215
Noncondensibles	39.2315	3.3337
Condensibles	150.8419	1.2629
TGNMO	190.0734	

(= 94.6566 mgC/cu.m)

RESEARCH TRIANGLE LABORATORIES

METHOD 25 DATA REPORT

Name: Analytical Testing Consultants ID #88-80-297 Date: 11/2/88

Sample # 5 3-I

TANK 4T35:
Volume (cu.m) = 0.004210

TRAP FD COLLECTION VESSEL:
Volume (cu.m) = 0.004551

	Pressure (mm Hg)	Temp.(K)		Pressure (mm Hg)	Temp.(K)
Presampling	0.0	284.3			
Postsampling	542.8	282.0			
Final	1056.0	293.2	Final	978.0	298.2

Volume Sampled (dscm) = 0.003128

Calibration Data:

	CO2	Backflush
Response Factor (area units/ppmC)	195.7	205.7
Blank (ppmC)	2.0	
Blank Area (area units)		681

Areas:

CO + CH4	26,018	26,255	26,307
CO2	3,987,400	4,006,400	4,011,500
Noncondensibles	10,798	10,480	10,162
Condensibles	48,424	49,282	48,881

Concentrations (ppmC):		%RSD
CO + CH4	250.5213	0.5881
CO2	38274.1700	0.3174
Noncondensibles	89.1646	3.2452
Condensibles	456.3717	0.8857
TGNMO	545.5363	

(= 271.6771 mgC/cu.m)

RESEARCH TRIANGLE LABORATORIES

METHOD 25 DATA REPORT

Name: Analytical Testing Consultants ID #88-80-297 Date: 11/2/88

Sample # 6 3-0

TANK 4T37:
Volume (cu.m) = 0.004190

	Pressure (mm Hg)	Temp.(K)
Presampling	0.0	284.3
Postsampling	697.7	282.0
Final	1000.0	295.2

Volume Sampled (dscm) = 0.004001

TRAP AA

COLLECTION VESSEL:
Volume (cu.m) = 0.004551

	Pressure (mm Hg)	Temp.(K)
Final	1130.0	299.2

Calibration Data:

	CO2	Backflush
Response Factor (area units/ppmC)	195.7	205.7
Blank (ppmC)	2.0	
Blank Area (area units)		681

Areas:

CO + CH4	7,252	7,342	7,441
CO2	1,450,800	1,461,300	1,449,100
Noncondensibles	3,066	3,407	1,704
Condensibles	22,216	21,614	19,909

Concentrations (ppmC):		%RSD
CO + CH4	51.4014	1.2871
CO2	10173.4400	0.4545
Noncondensibles	13.6133	44.0692
Condensibles	176.7443	5.7379
TGNMO	190.3576	

(= 94.7981 mgC/cu.m)