United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

EMB Report 79-GRA-3
August 1979

Air

Graphic Arts

Emission Test Report Texas Color Printers Dallas, Texas

Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

EMB Report 79-GRA-3
August 1979

GRAPHIC ARTS EMISSION TEST REPORT

Plant Tested

Texas Color Printers, Inc.
4800 Spring Valley Road
Dallas, Texas

April 9-13, 1979

Prepared for

Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Measurement Branch
Research Triangle Park
North Carolina 27711

by

W. R. Feairheller

Issued: October 19, 1979

MONSANTO RESEARCH CORPORATION
DAYTON LABORATORY
1515 Nicholas Road
Dayton, Ohio 45407

Report Reviewed by Frank Clay

Contract 68-02-2818, Work Assignment No. 20

TABLE OF CONTENTS

Section		Page
I	Introduction	1
II	Summary and Discussion of Results	3
III	Process Description and Operation	17
IV	Location of Sampling Points	21
V	Sampling and Analytical Procedures	31
APPENDICES		
A	Preliminary Velocity Data Inlet (and Outlet) - Adsorbers	35
B	Run Velocity Data Inlet - (Outlet) - Adsorbers	41
C	Preliminary and Run Velocity Data Inlet Damper NE Vent (Uptake) SW Vent (Uptake)	57
D	Meter Readings Press #1	75
E	Meter Readings Press #2	81
F	Press Run Data	87
G	Inlet Data - GC/FID	95
H	Outlet Data - GC/FID	107
I	Floor Sweep Data - GC/FID	119
J	TGNMO Analytical Data Sheets	129
K	Miscellaneous Analytical Data Sheets	175

LIST OF FIGURES

Number		Page
1	Process diagram showing air emission sources and duct work for carbon adsorption system.	22
2	Sampling site on inlet to the carbon adsorbers (location 1).	24
3	Diagram of the adsorber outlet stack and associated duct work (location 2).	26
4	Floor sweep exhaust from press 1 (location 3).	27
5	Floor sweep exhaust from press 2 (location 3A).	28

LIST OF TABLES

Number		Page
1	Summary of Sampling and Analytical Methods	4
2	Summary of Results	5

I. INTRODUCTION

The Texas Color Press Inc. Plant, located at 4800 Spring Valley Road, Dallas, Texas, was sampled during the week of April 9-13, 1979. The objective of the sampling program was to obtain volatile organic compound emission data from a well-controlled plant in order to provide background data for the establishment of new source performance standards. This plant, representing the Graphic Arts Industry category, employs a mixed naphtha, toluene xylene solvent system for the printing inks. Emissions of organic solvent vapors are controlled by a three-unit carbon adsorption system.

The sampling and on-site analysis was conducted by a Monsanto Research Corporation team consisting of W. R. Feairheller (team leader), K. Tackett, W. McDonald, and D. Sterling and was observed by Frank Clay of the Emission Measurement Branch of EPA. Mr. Gary Hipple of Pollution Control Science, Inc., Miamisburg, Ohio, collected samples for total gaseous non-methane organic (TGNMO) analysis during the test program. Pollution Control Science was hired as a subcontractor by Monsanto Research Corporation. Mr. Richard Reich of Radian Corporation was on-site to obtain process design and operation information.

Total hydrocarbon and specific compound gas chromatographic analysis data was collected on a semicontinuous basis at both the inlet and outlet of the carbon adsorber system. The solvent vapors from two presses and a proof press are collected by the air handling system and the solvent in the air is recovered by

the carbon adsorbers. The air in the room around the presses is ventilated by a separate system which is emitted directly to the atmosphere (uncontrolled). Grab samples of this ventilated air were collected and analyzed by on-site gas chromatography for specific chemical compounds. Samples of diluted ink were obtained from each of the ink feed tanks on the two presses for determination of solvent content. Samples of the water layer from the solvent/water decanter (separator) were also collected for solvent content.

The test program consisted of three sampling periods. Each test period was defined as the time required for all of the three carbon adsorbers to complete a sorption-desorption cycle. The test periods were of about 4 1/2 hour duration, during which each adsorber remained in the adsorption cycle for about 90 minutes, followed by a 45 minute desorption (steaming) period and a 15 minute cooling and conditioning period. Two of the three carbon beds were in the adsorption cycle at all times. At the beginning and end of each test period, the solvent recovery meter, the decanter solvent and the ink usage meter's readings were recorded.

The test program was observed by representatives of the Texas Air Control Board (TACB) and the Gravure Research Institute. Mr. Charles Shevlin (TACB-Austin) was present during the entire test period, while Dr. Robert James (TACB-Austin) and Mr. William Chafin (TACB-Fort Worth) were present for a portion of the test. Mr. Robert Oppenheimer and Mr. James Totura from the Gravure Research Institute were present during the entire program and collected samples and data during the test periods. No data is available on the results of these sampling activities.

II. SUMMARY AND DISCUSSION OF RESULTS

A summary of the sampling and analytical procedures employed at each site is given in Table 1. The sampling and analysis procedures followed the EPA test request, however, during run three, ink samples were obtained from the eight storage tanks (undiluted) rather than from the individual ink fountains on the presses. These samples will provide the concentration of the solvent in the ink as received by the plant. The amount of ink used is obtained from the ink meters at each fountain station. During runs 1 and 2, samples of diluted ink (in the ink fountains) were obtained. The meters indicate the ink, varnish and solvent added to the fountains, however, they do not indicate the actual amount of ink used during the run period.

The results of the velocity, total hydrocarbon, species analysis, TGNMO results and operating parameter are summarized in Table 2. Additional clarification of the data presented in the table is given below:

(1) Press 1 consisted of eight separate ink application stations. Press 2, however, has twelve application stations and can be run as two separate press units, one with eight ink fountains and one with four ink fountains.

Table 1. SUMMARY OF SAMPLING AND ANALYTICAL METHODS

LOCATION	PARAMETER	SAMPLING METHOD	ANALYTICAL METHOD
1 - Inlet to Adsorber	Velocity	Type S pitot tube	Inclined manometer
	Static pressure	Type S pitot tube	Inclined manometer
	Moisture	Method 4 (Run 1) wet/dry bulb (Run 2, 3)	Gravimetric, psychometric chart
	Temperature	Type K thermocouple	Digital thermometer
	Total hydrocarbon	Direct coupling	FID
	Organic species	Direct coupling	GC/FID
	Total carbon (A)	TGNMO procedure (B)	TGNMO procedure (B)
1A - Air Inlet	Temperature (ambient)	Type K thermocouple	Digital thermometer
	Moisture	Wet bulb/dry bulb	Psychometric chart
	Velocity	Vane anemometer	Calculation
2 - Outlet of Adsorber	Temperature	Type K thermocouple	Digital thermometer
	Moisture	Wet bulb/dry bulb	Psychometric chart
	Total hydrocarbon	Direct coupling	FID
	Organic species	Direct coupling	GC/FID
	Total carbon (A)	TGNMO procedure (B)	TGNMO procedure (B)
3, 3A - Floor Sweep Uptakes	Moisture	Wet bulb/dry bulb	Psychometric chart
	Temperature	Type K thermocouple	Digital thermometer
	Velocity	Type S pitot tube	Inclined manometer
	Organic species	Grab sample (bag)	GC/FID
	Total carbon (A)	TGNMO procedure (B)	TGNMO procedure (B)
4 - Press Meters, Ink Fountain	Ink usage	Read meter	Calculation
	Varnish usage	Read meter	Calculation
	Solvent usage	Read meter	Calculation
	Solvent content of ink	Collect grab samples at fountain (Run 1, 2)	% solvent in ink (diluted) GC/FID
	Solvent content of ink	Collect grab sample on tanks (Run 3)	% solvent in ink (as received) GC/FID
	Total carbon (A)	TGNMO procedure (4 samples) (B)	TGNMO procedure (4 samples) (B)
5 - Decanter	Solvent recovered	Read meter	Calculation
	Solvent in water layer	Grab samples (3 total)	GC/FID
	Total carbon (A)	TGNMO procedure (1 sample) (B)	TGNMO procedure (1 sample) (B)
6 - Solvent Meter	Recovered solvent used	Read meter	Calculation

Notes (A) Total carbon sampling and analysis done by Pollution Control Science, Miamisburg, Ohio

(B) TGNMO is Total Gas Non-Methane Organics. See Section V for description of method.

Table 2. SUMMARY OF RESULTS

Parameter (units)	Run 1	Run 2	Run 3
Operational Data			
Date	4/11	4/12	4/12
Start time	1445	0850	1320
Finish time	1915	1320	1750
Elapsed time (min.)	270	270	270
Press 1 run time (min.)	207	214	216
Press 2, 8 units run time (min.)	141	206	234
Press 2, 4 units run time (min.)	30	188	117
Solvent used meter (gals.)	664.9	709.6	769.6
Solvent recovered decanter (gals.)	859	881	764
Ink meter total (gals.)	558	575	563
Varnish meter total (gals.)	30	24	92
Solvent meter total (gals.)	553	629	685
Total solvent in press (including inks solvent) (gals.)	900	978	1078
Solvent in ink used (gals.)	347	293	449
Steam rate (lb/lb solvent recovered)	4.5	4.5	4.5
Condensed water (gals.)	2864	2939	2547
Solvent recovered to solvent used ratio	0.95	0.90	0.71
Velocity Parameters			
Inlet			
Area (ft^2)	20.13	20.13	20.13
Average temperature (°F)	90.0	94.0	94.8
Moisture (%)	1.2	1.5	1.5
Molecular weight of gas	28.84	28.84	28.84
Velocity ft/sec	53.5	54.8	54.7
Volumetric flow rate (SCFM)	60,600	61,700	61,400
Volumetric flow during steaming (SCFM)	---	60,200	60,300
Volumetric flow during drying (SCFM)	---	68,100	67,900
Volumetric flow during idle (SCFM)	---	60,100	59,800
Outlet			
Average temperature (°F)	88	89	89
Moisture (%)	1.4	1.4	1.4

Table 2 (Continued). SUMMARY OF RESULTS

Parameter (units)	Run 1	Run 2	Run 3
Velocity Parameters			
Site 1A Inlet			
Area (ft^2)	7.07	7.07	7.07
Moisture (%)	1.4	1.5	1.5
Average temperature (°F)	75	75	75
Velocity (ft/sec)	13.1	9.7	9.7
Volumetric flow rate (SCFM)	5,220	3,860	3,860
Floor Sweep (NE) 8 unit press			
Area (ft^2)	6.67	6.67	6.67
Average temperature (°F)	77	80	80
Moisture (%)	1.3	1.2	1.2
Molecular weight of gas	28.84	28.84	28.84
Velocity (ft/sec)	20.1	20.4	20.4
Volumetric flow rate (SCFM)	7,690	7,850	7,850
Floor Sweep (SW) 12 unit press			
Area (ft^2)	7.5	7.5	7.5
Average temperature (°F)	75.6	79.0	79.0
Moisture (%)	1.1	1.3	1.3
Molecular weight of gas	28.84	28.84	28.84
Velocity (ft/sec)	23.4	27.5	27.5
Volumetric flow rate (SCFM)	10,100	11,900	11,900
Measured Data			
Total solvent thru inlet duct (gals.)	466.6	581.7	698.1
Total solvent emitted from adsorber (gals.)	16.7	70.2	23.2
Adsorber efficiency (%)	96.4	87.9	96.7
Total solvent loss from NE floor sweep (gals.)	27.6	34.2	39.0
Total solvent loss from SW floor sweep (gals.)	33.9	50.5	56.5
Total solvent loss (gals.)	78.2	154.9	118.7
Total solvent used in process (gals.)	900	978	1078
Total solvent adsorbed (gals.)	450	512	675

Table 2 (Continued). SUMMARY OF RESULTS

SOURCE CONCENTRATION DATA - INLET TO ADSORBER

	Run 1	Run 2	Run 3
Toluene			
Concentration as toluene (ppm)	298	356	421
Concentration as carbon (ppm)	2086	2490	2945
Concentration as carbon (mg/m^3)	1041	1243	1470
Total carbon emitted (Kg)	482.4	575.7	689.9
Total toluene emitted (gals.)	161.4	192.6	230.9
Naphtha			
Concentration as naphtha (ppm)	384	489	580
Concentration as carbon (ppm)	3070	3914	4639
Concentration as carbon (mg/m^3)	1532	1953	2315
Total carbon emitted (Kg)	709.8	904.9	1087
Total naphtha emitted (gals.)	305.2	389.1	467.2
Total Hydrocarbons			
Concentration as carbon (ppm)	6111	6441	6582
Concentration as carbon (mg/m^3)	3049	3214	3284
Total carbon emitted (Kg)	1413	1489	1542
TGNMO			
Concentration as carbon (ppm)	7021	10691	11109
Concentration as carbon (mg/m^3)	3507	5341	5550
Total carbon emitted (Kg)	1625	2519	2606
Total Solvent			
Total solvent emitted (gals.)	466.6	581.7	698.1

Table 2 (Continued). SUMMARY OF RESULTS

SOURCE CONCENTRATION DATA - OUTLET OF ADSORBER

	Run 1	Run 2	Run 3
Toluene			
Concentration as toluene (ppm)	9.5	25.7	9.2
Concentration as carbon (ppm)	66.5	179.9	64.4
Concentration as carbon (mg/m^3)	33.2	89.8	32.1
Total carbon emitted (Kg)	15.4	42.4	15.1
Total toluene emitted (gals.)	5.15	14.2	5.1
Naphtha			
Concentration as naphtha (ppm)	14.5	69.2	22.5
Concentration as carbon (ppm)	116	553.3	180
Concentration as carbon (mg/m^3)	57.9	276.1	89.8
Total carbon emitted (Kg)	26.9	130.2	42.2
Total naphtha emitted (gals.)	11.57	56.0	50.9
Total Hydrocarbons			
Concentration as carbon (ppm)	183	733	244
Concentration as carbon (mg/m^3)	91.1	365.9	121.9
Total carbon emitted (Kg)	42.3	172.6	57.2
TGNMO			
Concentration as carbon (ppm)	328	400	512
Concentration as carbon (mg/m^3)	164	200	256
Total carbon emitted (Kg)	76.1	94.3	120.2
Total Solvent			
Total solvent emitted (gals.)	16.7	70.2	23.2

Table 2 (Continued). SUMMARY OF RESULTS

SOURCE CONCENTRATION DATA - NORTHEAST FLOOR SWEEP VENT

	Run 1		Run 2		Run 3	
Toluene						
Concentration as toluene (ppm)	116		138		158	
Concentration as carbon (ppm)	813		969		1106	
Concentration as carbon (mg/m^3)	406		484		552	
Total carbon emitted (Kg)	23.8		29.0		33.1	
Total toluene emitted (gals.)	8.0		9.7		11.1	
Naphtha						
Concentration as naphtha (ppm)	184		227		256	
Concentration as carbon (ppm)	1468		1816		2047	
Concentration as carbon (mg/m^3)	732		906		1022	
Total carbon emitted (Kg)	43.1		54.4		61.3	
Total naphtha emitted (gals.)	18.5		23.4		26.4	
Xylene						
Concentration as xylene (ppm)	13.3		13.6		18.6	
Concentration as carbon (ppm)	106		109		148.4	
Concentration as carbon (mg/m^3)	52.9		54.4		74.0	
Total carbon emitted (Kg)	3.1		3.3		4.4	
Total xylene emitted (gals.)	1.1		1.1		1.5	
Total Hydrocarbons						
Concentration as carbon (ppm)	2392		2893		3303	
Concentration as carbon (mg/m^3)	1194		1444		1648	
Total carbon emitted (Kg)	70.2		86.7		98.9	
TGNMO						
Concentration as carbon (ppm)	2116	2341	4358	2467	2766	
Concentration as carbon (mg/m^3)	1057	1170	2177	1232	1382	
Total carbon emitted (Kg)	62.2	68.8	130.7	73.9	82.9	
Total Solvent						
Total solvent emitted (gals.)	27.6		34.2		39.0	

Table 2 (Continued). SUMMARY OF RESULTS

SOURCE CONCENTRATION DATA - SOUTHWEST FLOOR SWEEP VENT

	Run 1	Run 2	Run 3
Toluene			
Concentration as toluene (ppm)	110	134	149
Concentration as carbon (ppm)	772	940	1048
Concentration as carbon (mg/m^3)	385	469	523
Total carbon emitted (Kg)	29.7	42.7	47.6
Total toluene emitted (gals.)	10.0	14.3	15.9
Naphtha			
Concentration as naphtha (ppm)	171	222	246
Concentration as carbon (ppm)	1368	1776	1969
Concentration as carbon (mg/m^3)	683	886	983
Total carbon emitted (Kg)	52.8	80.7	89.4
Total naphtha emitted (gals.)	22.7	34.7	38.4
Xylene			
Concentration as xylene (ppm)	11.7	12.3	18.3
Concentration as carbon (ppm)	93.8	99.0	146
Concentration as carbon (mg/m^3)	46.8	49.4	72.9
Total carbon emitted (Kg)	3.6	4.5	6.6
Total xylene emitted (gals.)	1.2	1.5	2.2
Total Hydrocarbons			
Concentration as carbon (ppm)	2237	2811	3154
Concentration as carbon (mg/m^3)	1116	1403	1574
Total carbon emitted (Kg)	86.2	127.6	143.2
TGNMO			
Concentration as carbon (ppm)	2067	3669 4325	1970 3174
Concentration as carbon (mg/m^3)	1033	1833 2161	984 1585
Total carbon emitted (Kg)	79.8	167 197	89.5 144.2
Total Solvent			
Total solvent emitted (gals.)	33.9	50.5	56.5

MONSANTO
TEXAS COLOR
PN#118-1
5/15/79

Table 2 (Continued). SUMMARY OF RESULTS

TGNMO DATA SUMMARY

SAMPLE ID	1st Tank NO.	1st Tank mg C_1	1st Tank SAMPLE VOLUME (ℓ)	2nd Tank NO.	2nd Tank mg C_1	2nd Tank SAMPLE VOLUME (ℓ)	Total Tanks mg C_1	Total Tanks ppm C_1	Trap NO.	Trap mg C_1	Trap ppm C_1	Total ppm C_1	Total mg C_1/ℓ	Total SAMPLE VOLUME
TC-AI-1	27	0.554	2.465	31	0.495	2.490	1.049	424	15	16.33	6595	7021	3.507	4.955
TC-AO-1	17	0.158	2.259	38	0.202	2.284	0.360	159	27	0.383	167	328	0.164	4.543
TC-AI-2	23	1.968	2.596	47	0.576	2.533	2.544	993	35	24.85	9698	10691	5.341	5.129
TC-AO-2	20	0.134	1.591	32	0.313	1.385	0.448	301	3	0.148	100	400	0.200	2.976
TC-AI-3	45	0.406	2.365	44	0.579	2.452	0.985	409	88	25.75	10700	11109	5.550	4.817
TC-AO-3	18	0.167	1.678	29	0.401	1.859	0.568	321	87	0.336	190	512	0.256	3.537

TC = Texas Color
AO = Adsorber Outlet
AI = Adsorber Inlet
EFS = East Floor Sweep
WFS = West Floor Sweep

Table 2 (Continued). SUMMARY OF RESULTS

TGNMO DATA SUMMARY

SAMPLE ID	Tank NO.	Tank mg C_1	Tank ppm C_1	Trap NO.	Trap mg C_1	Trap ppm C_1	Total ppm C_1	Total mg C_1/ℓ	SAMPLE VOLUME (ℓ)
TC WFS-1	4	0.275	223	21	2.271	1844	2067	1.033	2.465
TC WFS-2A	26	0.414	278	51	5.053	3391	3669	1.833	2.983
TC WFS-2B	43	0.257	194	46	5.461	4131	4325	2.161	2.646
TC WFS-3A	40	0.418	287	89	2.450	1683	1970	0.984	2.914
TC WFS-3B	25	1.123	929	55	2.715	2245	3174	1.585	2.421
TC-EFS-1A	22	0.345	270	37	2.353	1846	2116	1.057	2.552
TC-EFS-1B	35	0.737	530	13	2.518	1811	2341	1.170	2.783
TC-EFS-2	3	0.263	203	41	5.389	4155	4358	2.177	2.596
EC-EFS-3A	24	0.155	105	45	3.491	2362	2467	1.232	2.958
TC-EFS-3B	19	0.219	142	44	4.049	2624	2766	1.382	3.089
BLK-PRETEST	34	0.499	329	-	-	-	329	0.165	3.032
BLK-POST TEST	39	0.520	328	-	-	-	328	0.164	3.170

MONSANTO
TEXAS COLOR
PN#118-1
Samples Rec'd 4/26/79
Results Submitted 5/16/79

Table 2 (Continued). SUMMARY OF RESULTS

ANALYSIS OF INK SAMPLES

PCS SAMPLE #	SAMPLE I.D.	lbs Carbon/gallon Ink
#79-872	D-1 RBA-3 BLACK #1	2.04
#79-873	D-1 RBA-3 BLACK #2	3.67
#79-874	2-5-1 YELLOW #1	7.60
#79-875	2-5-1 YELLOW #2	3.86
#79-876	2-6-1 RED #1	5.43
#79-877	2-6-1 RED #2	7.57

(2) The solvent used data is taken from the meter that records the amount of recovered and/or fresh solvent used by the presses. The decanter meter provides the amount of solvent removed from the decanter and returned to storage. Each ink fountain has three meters which indicate the amount of ink, varnish and solvent added to the fountain. The total solvent into the press includes the solvent in the ink and the fresh solvent. The solvent recovered to solvent used ratio is obtained from the decanter readings divided by the total solvent into the press value.

(3) According to plant information, 4.5 lb. of steam is required to recover each lb. of solvent. The density of solvent samples supplied by the plant was found to be 0.742 gram/ml. This data was used to calculate the amount of condensed water.

(4) The average velocity and volumetric flow rate data was obtained from both preliminary traverse data and the monitoring of the response of a pitot tube at the point of average velocity during the sampling runs. Under normal plant operation, two adsorbers are in the adsorber cycle at all times while the third is in a steam, cooling or idle cycle. The data given on volumetric flow during steaming, drying or idle indicates the changes in inlet velocity while one adsorber is in the steaming, drying or idle period and the other two are adsorbing. These changes are due to the increased or decreased resistance of the entire carbon adsorber system while these operations are occurring.

(5) The measured data is obtained from the hydrocarbon concentration determined from the inlet, outlet and floor sweep ducts. Based on this data, the carbon bed efficiency is about 96.4-96.7% unless breakthrough occurred as shown by the 88% efficiency on Run 2 and a major increase in the concentration determined at the outlet duct.

(6) The data indicates that considerable solvent is lost from the floor sweep vents. If these vents were directed into the carbon adsorber system, additional solvent could be recovered.

(7) The data indicates that the amount of solvent collected by the adsorber from the hydrocarbon concentration data is considerably lower than the data indicated by the decanter reading. There is no apparent reason for this.

III. PROCESS DESCRIPTION AND OPERATION

The Texas Color Printers, Inc. plant operates two rotogravure publication presses. These two presses (press 741 and 742) were monitored during the emissions test. The dryer exhaust from press 741 and 742 is combined with the dryer exhaust from the gravure proof press. This solvent laden air (SLA) exhaust stream is controlled by a carbon adsorption, solvent recovery system.

A. THE PRINTING OPERATION

Texas Color Printers uses a mixed petroleum fraction for their gravure solvent. Typical toluene and xylene contents are about 30% and 4%, respectively. The balance of the solvent (66%) is lactol spirits. Two grades of gravure ink (Group 1 and Group 5) are used at this plant.

Press 741 is a 10-unit Motter press, however, only 8 units were in operation during the test. Press 742 is a 12-unit Motter press. This press consists of separate 8 and 4-unit sections, each of which is fed using individual reel stands. All presses have a web capacity of 94 inches, with a cylinder circumference of 43 inches.

The printing unit dryers do not contain hydrocarbon analyzers for controlling preset exhaust concentrations. Each dryer, however, has a separate fan for internal exhaust recirculation. The dryer inlet is located very close to the nip area, and should provide excellent capture efficiency in the impression and ink trough area.

B. FUGITIVE EMISSIONS

Fugitive emissions are collected by using floor sweeps in the lower areas of the press room. The presses have a floor sweep for each unit, located on the side of the press near the ink tank. The floor sweeps are tied into a separate header for each press. The exhaust from these floor sweeps is not treated by the carbon adsorption system. A separate roof fan for each header discharges the floor sweep exhaust into the atmosphere.

C. THE EMISSION CONTROL SYSTEM

The emission control system used at this plant is a Croftshaw design. The system consists of three horizontal adsorption vessels containing activated carbon. Two vessels adsorb simultaneously for a total solvent laden air (SLA) capacity of 75,000 CFM. The SLA stream collected from the dryer exhausts is drawn through a header system on the press room roof. Two 150 HP fans draw the SLA through roll-fed filters and force the air through the adsorption vessels. The treated airstream is ducted into an exit header and discharged to the atmosphere.

The adsorption cycle, which is regulated by a timer, lasts 3 hours per vessel. The cycles are staggered, thus permitting enough time for regeneration of one bed while the other two are adsorbing. Regeneration is accomplished by countercurrent live steam stripping of the adsorption vessel. The 45 minute regeneration cycle is controlled by a timer. A 15 minute cooling period immediately follows regeneration. The cooling cycle consists of placing the hot, wet, newly regenerated bed on line, to operate along with the other two beds. The inlet SLA, which enters at about 100°F, cools and removes excess moisture from the bed. After the cooling cycle, the newly regenerated bed is taken off line until it is needed.

During the regeneration cycle, the stripping steam passes through an adsorber and into the condensers. The two phase condensate is cooled and sent to the decanter. The dewatered solvent flows from the decanter into the underground solvent storage tanks. The steam condensate flows from the decanter into a hot well, where the condensate is recycled as boiler feed water.

D. OPERATING CONDITIONS

The plant operated in a normal fashion during the testing period. In general, the test ran very well. Although the printing capacity was not maximum, typical conditions existed for the press room. Press 741 printed a color newspaper advertising supplement using a 62 1/2-inch web. Press 742 printed a color feature section of a magazine using a 93-inch web.

IV. LOCATION OF SAMPLING POINTS

A schematic diagram of the process with respect to the sampling locations is shown in Figure 1. Sites 1 and 1A were located on the inlet system to the carbon adsorbers with site 1 located between the presses and the adsorbers and site 1A at a fresh air entrance to the inlet manifold. This dilution air was emitted to the duct in order to reduce the negative pressure of the fans and thus prevent collapse of the duct work. Site 2 was located at the adsorbers outlet to the atmosphere. Sites 3 and 3A, which are uncontrolled air emission sources, provide for removal of vapor laden air from the room housing the presses in order to reduce the solvent concentration in this area. Site 4, the meters that indicate the amount of ink, varnish and solvent determined to each of the twenty ink fountains were read before and after each test to provide an indication of the total usage of these materials. Samples of the diluted ink in the fountains were collected for determination of the amount of solvent in the ready-to-apply ink. Samples of the water from the decanter were collected for analysis of the amount of solvent remaining in the water after separation of the solvent-water layers (site 5) and in addition, readings of the solvent recovery meter on the decanter were made before and after each sampling run. Site 6, the solvent use meter, required no sampling, however, meter readings were taken before and after each sampling run to provide an indication of the total amount of solvent used by both presses during the sampling period.

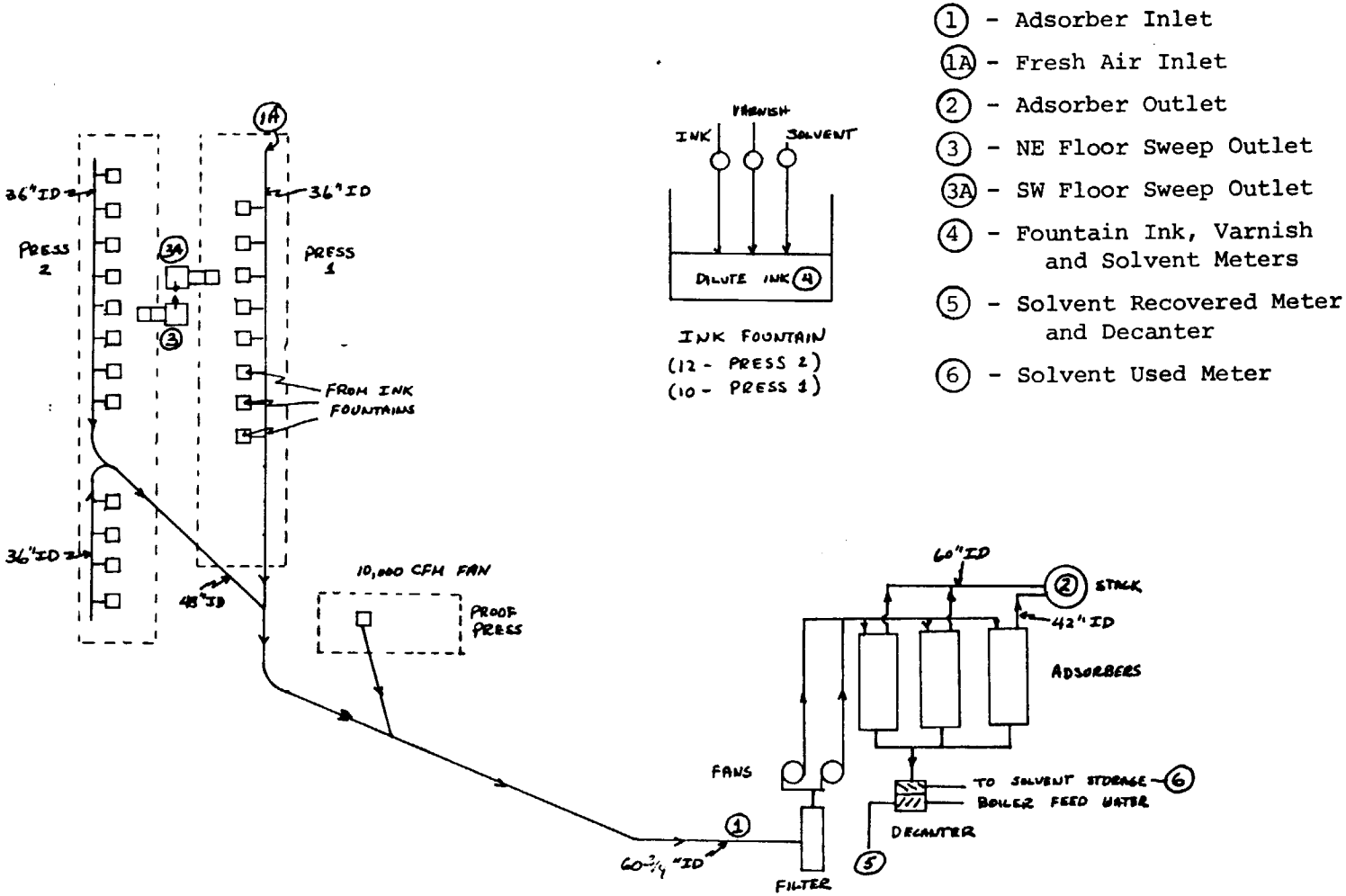


Figure 1. Process diagram showing air emission sources and duct work for carbon adsorption system.

At Texas Color Printers, Inc., each press was equipped with a recording tachometer. Everett Williams, the plant engineer, supplied copies of the strip charts that provide the press speed as well as the running times of the presses during each of the sampling run periods.

Details of each of the sampling locations are given below:

At location (1), the adsorber inlet, vapor laden air from each of the fountains are directed to the roof through duct work. The ducts from press 1 are connected to a 36" I.D. manifold. The ducts from 8 fountains of press 2 are connected to a 36" manifold as are the other four fountains to another 36" manifold. The latter two manifolds connect into a 48" I.D. duct, which is then joined by the manifold from press 1 and the duct is expanded into a 58" diameter. The ventilation system from the proof press passes through the roof, a 10,000 cfm fan, and connects into the duct. From this point the duct is increased to 60 3/4" I.D. and is directed to the filter, fans and adsorbers. The 60 3/4" I.D. duct has a straight run of 60 feet that provided an excellent sampling site. A diagram of the sampling location is shown in Figure 2. Two ports were cut into the duct, one at the top and one the side 90° from the top port.

The end of the manifold over press 1 has a damper that is normally in the closed position, and it was in this position during each of the sampling runs. However, the end of the manifold over press 2 is open so that the dilution air would reduce the negative pressure in the duct to maintain a 4-6" of water negative pressure. As there was no suitable location at the inlet end of this 36" I.D. manifold duct (site 1A) that would meet Method 1 sampling port locations, a dilution air velocity measurement was obtained by using a vane anemometer to traverse across the open

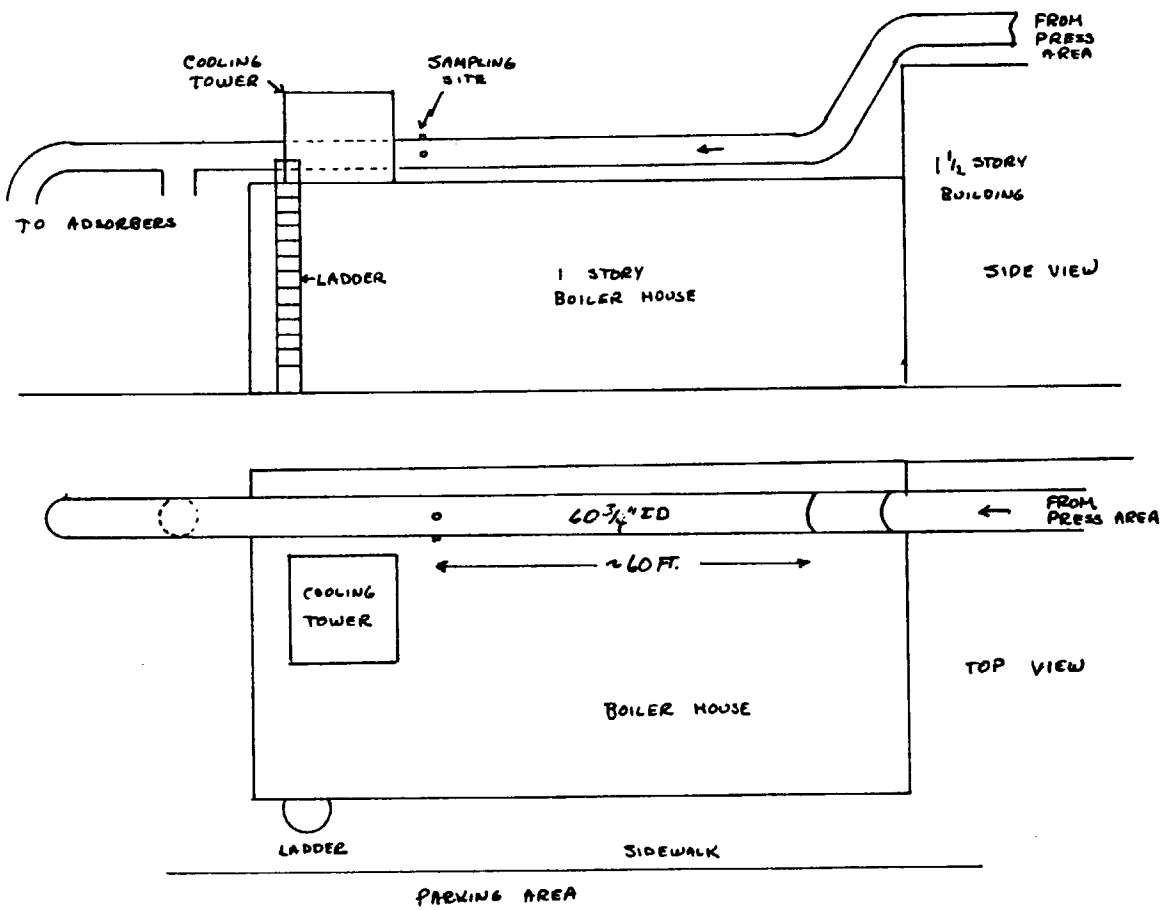


Figure 2. Sampling site on inlet to the carbon adsorbers (location 1).

end of the duct. The velocity was calculated by measuring the total number of feet of air passing over the blades for a given time interval.

A diagram of the adsorber outlet stack is shown in Figure 3. The outlet of adsorbers 1 and 2 join into a 60" I.D. duct, which connects to the bottom of the stack, while adsorber 3 has a separate 42" duct that connects at a location higher on the stack. The lower 24 feet of the stack is 60" I.D., but the top 5'6" is conical shaped to a maximum of 73 3/4" at the top. As a result, there is no suitable location where reliable velocity data could be obtained. A VOC sampling site was selected just below the beginning of the conical portion of the stack, opposite to the inlet duct entrances. For velocity determination, it was assumed that the volumetric flow rate would be the same on the outlet stack as the inlet (site 1).

The floor sweeps for presses 1 and 2 (sites 3 and 3A) collect air from the room area around the presses. Each unit has several air inlets near floor level and higher up (6-7') which are manifolded together and then a single duct passes through the roof to a fan. The fan exhaust is directly to the atmosphere. Velocity and VOC data were obtained on the roof in the duct work on the inlet side of the fan. The location of traverse points are shown in Figures 4 and 5.

The ink fountains (site 4) at this plant are automatically controlled to maintain the proper depth and viscosity of the ink by controlling the addition of bulk ink, solvent and varnish. Meters at each fountain were read at the beginning and end of each test period. Samples of the diluted ink in each fountain were collected during the run. Separate analyses were performed on the ink in each fountain, as the amount of solvent varies

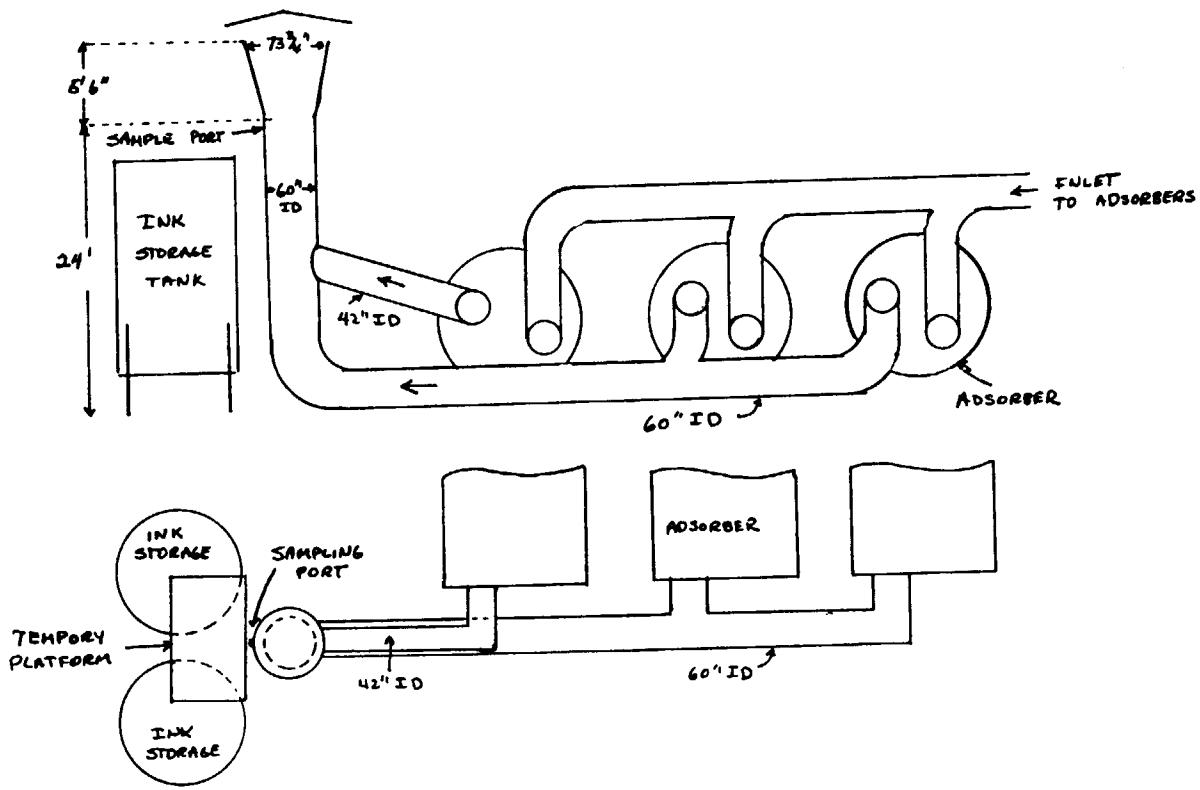


Figure 3. Diagram of the adsorber outlet stack and associated duct work (location 2).

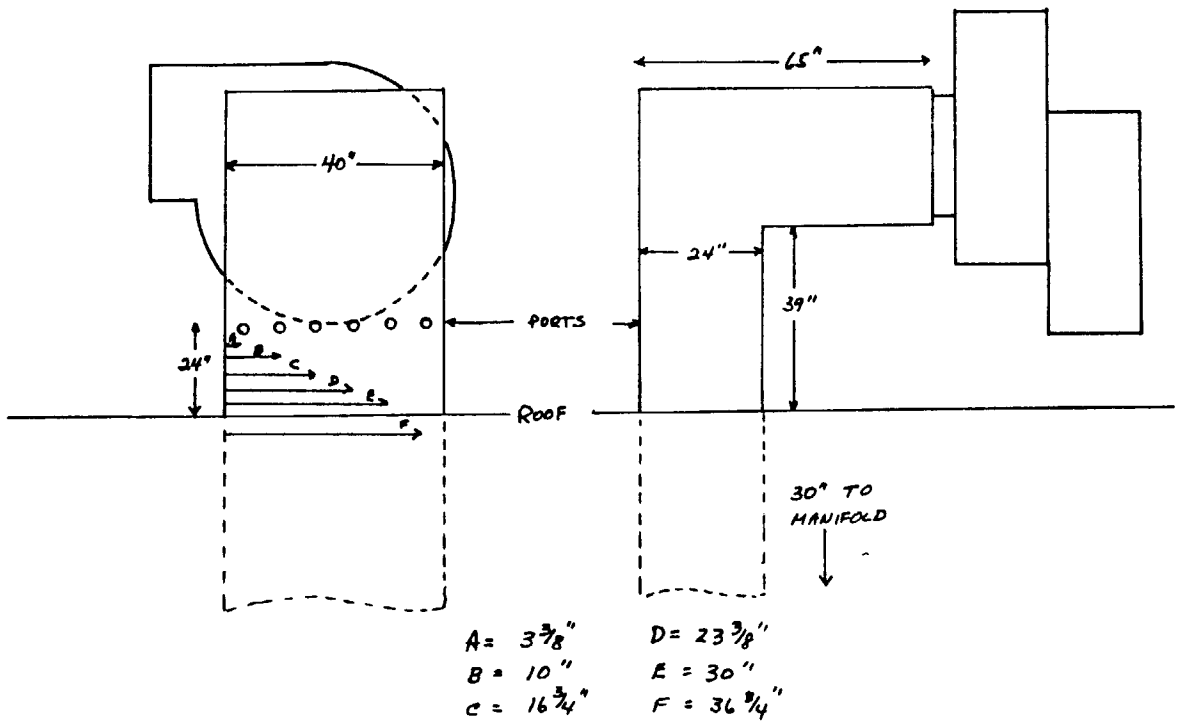


Figure 4. Floor sweep exhaust from press 1 (location 3).

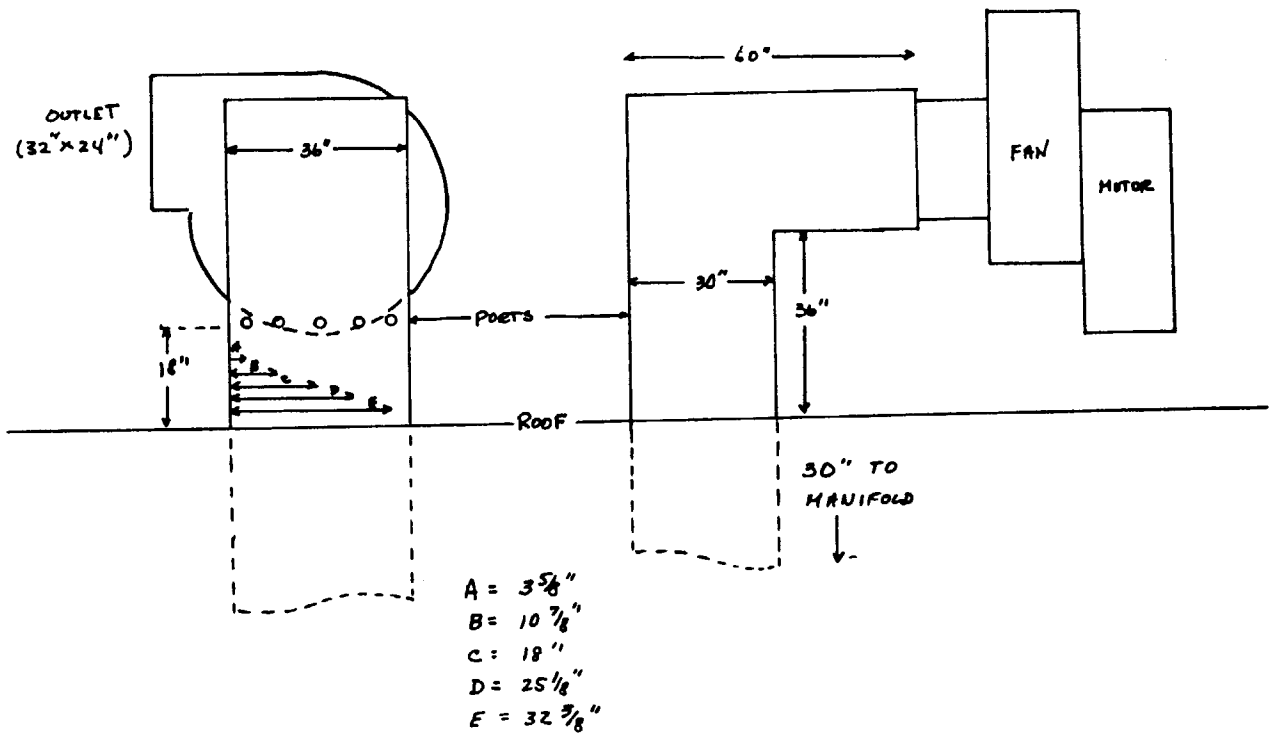


Figure 5. Floor sweep exhaust from press 2 (location 3A).

from one color to another. Thus, a total of twenty ink samples were collected during each run.

The decanter (site 5) is equipped with a meter that indicates the amount of solvent recovered. This meter was read before and after each sampling run to provide the amount of solvent recovered during each test period and also the amount of solvent recovered from the beginning of the program to the end of the program. Samples of the water layer in the decanter were collected during each run for analysis of the concentration of solvent remaining in the water phase. The actual amount of solvent used by the presses was obtained from a meter (site 6), however, this meter provided a total amount of solvent to both presses rather than the amount used by press 1 or press 2 alone.

The control panel for the adsorber system is located within the boiler room. The panel has indicator lights that show the operational status of each adsorber. This panel indication was monitored during each test in order to provide the total sampling period and the cycles of operation. There is no steam flow indicator at this plant, however, the plant personnel indicated that usually 4 1/2 pounds of steam are required for each pound of solvent.

V. SAMPLING AND ANALYTICAL PROCEDURES

The procedures for the determination of the temperature, static pressure, velocity, moisture and volumetric flow rate followed the procedures given in Methods 1, 2, and 4 as presented in the Federal Register (August 18, 1977).

The total hydrocarbon and specific organic compound analyses were obtained by directly coupling a flame ionization gas chromatograph to both sites 1 and 2. AID Model 511 Chromatographs were used at both sites and these instruments can be operated in both the total hydrocarbon and GC modes by internal valve switching. Both analysis methods were used during the test periods. The species analysis was accomplished with 1/8 x 6' stainless steel columns containing 5% SP1200/1.75% Benton 34 on Supelcoport column maintained at 120°C.

At site 1, the inlet to the control system, the instrument was located several feet from the ports on the duct work. A sample probe of 1/4" stainless steel line, with a stainless steel filter assembly containing a sintered metal filter to act as a filter and flame arrester, was inserted into the duct through the port. A heated Teflon sample line connected the probe to an isolation valve and then to the inlet of the gas sampling valve on the gas chromatograph. A pump was attached to the outlet side of the gas sampling valve through an isolation valve in order to draw the vapor laden air from the duct into the chromatograph. A stainless steel tee fitting was connected between the stainless steel probe and the Teflon sample line for the introduction

of standard gas mixtures. Sample gas and standards were chromatographed in an identical manner by isolating the sample loop from the source and the pump, allowing the loop to reach atmospheric pressure and then injecting the sample.

It was intended that an identical apparatus should be used at site 2. However, with this type of system, the instrument would have been set up directly above the ink storage tanks and thus present a safety hazard. The instrument was set up inside the sampling van which was parked adjacent to the adsorber area, about 40 feet from the ink storage tanks. The stainless steel probe was connected to a tee fitting as before, however, a 60 feet length of 1/4" copper tubing was used to connect the probe to the chromatograph, through a liquid trap. A short length of 1/4" Teflon tubing connected the trap to a sample splitter on the inlet of the chromatograph gas sampling valve. The outlet side of the splitter and sampling valve were connected through an isolation valve to an integrated gas sampling pump (EPA Method 3). This system with the sample splitter and the pump operated at about 3-4 scfh provided for rapid delivery of the source gas to the instrument. As the temperature of the gas in the outlet stack was very close to the ambient temperature during the test period, no condensation problems were expected and this was verified by the fact that no condensable material was collected in the trap during any of the sampling runs.

Grab gas samples from sites 3 and 3A were collected using a hand operated sampling pump to fill 12 x 12" Teflon sampling bags. Separate bags were used for each site and were flushed and leak checked with nitrogen between each run. The collected samples were analyzed on-site using a Hewlett-Packard Model 5750 gas chromatograph equipped with a heated gas sampling valve, a 1/8" x 6' stainless steel column containing 5% SP1200/1.75%

Bentone 34 on 100/200 Supelcoport and a flame ionization detector. The chromatograph was operated in an isothermal mode at 100°C.

Ink samples were collected in 45 ml vials with Teflon backed septum caps of the type recommended for priority pollutant water analysis. The bottles were filled to the top (no void space), capped and maintained in an ice chest (0°C) prior to analysis. These samples were analyzed in the laboratory by injecting 1 μ liter of the liquid into a Perkin Elmer 3920 gas chromatograph equipped with a 1/8" x 20" 10% FFAP column and a flame ionization detector. The column was operated isothermally at 90°C.

Water samples were collected in 1 liter Wheaton bottles (with Teflon lined caps) previously cleaned and heated in an oven to remove organic compounds. The bottles were filled to the top to eliminate void space, and held at 0°C prior to analysis. The samples were analyzed by direct injection on a Perkin Elmer 3920 gas chromatograph equipped with a 1/8" x 10' Poropak P column, operated at 170°C, and a flame ionization detector.

The AID chromatograph and the HP 5750 were calibrated using commercial toluene in nitrogen mixtures and site-prepared solvent standards using the Ford Motor Company "Solvent Standard Preparation Procedures", May 18, 1977.

The total gas non-methane organic (TGNMO) sampling was done by Mr. Gary Hipple of Pollution Control Science, Inc. (PCS). Details of the sampling and analysis procedure is presented in the EPA Guideline Series document entitled, "Measurement of Volatile Organic Compounds", EPA-450/2-78-041, October 1978. In brief, the sampling procedure involves collection of an emission sample anisokinetically through a condensation trap by means of an

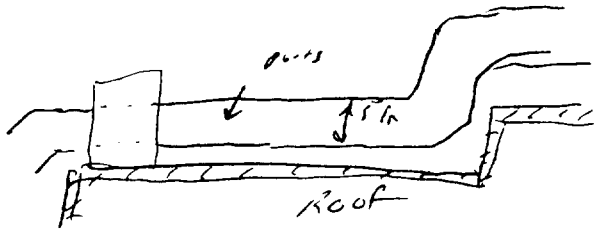
evacuated gas collection tank. The condensation trap is maintained at dry ice temperatures. Any material that is not condensed in the trap will be collected in the evacuated cylinder. After sampling was complete the traps were blanketed in dry ice and shipped to PCS by MRC van. During analysis the contents of the condensate trap are oxidized to carbon dioxide, which is quantitatively collected in an evacuated vessel. A portion of the carbon dioxide is reduced to methane and the quantity of methane is measured by a flame ionization detector. A portion of the sample collected in the gas sampling tank is analyzed by a gas chromatograph to achieve separation of the non-methane organic compounds from carbon monoxide, carbon dioxide and methane. The non-methane organic compounds are oxidized to carbon dioxide, reduced to methane and measured by a flame ionization detector. The total non-methane organic compounds concentration is obtained from the combination of the analytical results from the condensate trap and the gas sampling tank.

APPENDIX A

PRELIMINARY VELOCITY DATA
INLET (AND OUTLET) - ADSORBERS

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Texas Color Printers, Inc.
DATE 4/9/79
SAMPLING LOCATION Inlet
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) 60 7/8'
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) 1/8"
STACK I.D., (DISTANCE A - DISTANCE B) 60.75"
NEAREST UPSTREAM DISTURBANCE 25' (45° Ell) 5 ED
NEAREST DOWNSTREAM DISTURBANCE 26' (45° Ell) 4 ED
CALCULATOR Tackett



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.026	60.75	1.58 (1 5/8)	1/8	1 3/4
2	.082		4.98 (5)		5 1/8
3	.146		8.87 (8 7/8)		9
4	.226		13.73 (13 3/4)		13 7/8
5	.342		20.78 (20 3/4)		20 7/8
6	.658		39.97 (40.0)		40 1/8
7	.774		47.02 (47)		47 1/8
8	.854		51.88 51 7/8		52
9	.918		55.77 55 3/4		55 7/8
10	.974		59.17 59 1/8		59 1/4

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Texas Color
DATE 7/9/79
LOCATION Inlet (Preliminary)
STACK I.D. 60 3/4
BAROMETRIC PRESSURE, in. Hg 29.04
STACK GAUGE PRESSURE, in. H_2O -2.8
OPERATORS Tackett

-2.8" H_2O C_p=0.80

SCHEMATIC OF TRAVERSE POINT LAYOUT

Top

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.59	88
2	0.79	88
3	0.87	90
* 4	0.98	90
5	1.10	90
6	1.10	90
7	1.10	96
8	1.12	90
9	1.10	90
10	0.79	90
AVERAGE		

Side

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
1	0.87	88
2	0.95	89
3	1.00	89
4	1.12	90
5	1.12	90
6	1.14	90
7	1.15	90
8	1.20	90
9	1.18	90
10	1.06	90
AVERAGE	1.08	89.0

EPA (Dur) 233
4/72

MOISTURE IN STACK GAS DETERMINATION

METHOD 4

Plant Texas Color Date 4/1/79

Run # ~~[illegible]~~ Preliminary Location Sampled Inlet

Volume of gas at meter conditions (CF) = VM = ~~[illegible]~~ 20.357 − 18.125 = 2.232

Average meter temperature (°F) = TM = 68°F

Barometric pressure absolute (in Hg) = PB = 29.04

VMS = Volume of gas sampled at standard conditions (SCF)

$$VMS = \frac{(17.64)(VM)(PB)}{(TM + 460)} = \frac{17.64\ (2.232)(29.04)}{(68 + 460)} = \text{~~2.095~~ } 2.165$$

Volume of water final 10 Wt. of silica gel final 32.2

Volume of water initial 10 Wt. of silica gel initial 31.6

Volume collected V_1 = 0 Wt. of water V_2 = 0.6 gm

Total volume of water collected (ml) = $V_1 + V_2$ = VL = 0.6

Volume of water vapor at standard conditions (CF) = VW

VW = (.0471)(VL) = .0471(0.6) = .028

Mole fraction of water vapor = M

$$M = \frac{VW}{VMS + VW} = \frac{(.028)}{(\text{~~2.095~~ } 2.165) + (.028)} = M = .0129$$

Percent moisture = (100)(M) = 100 (.013) = %M 1.29

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR PRINTERS

Date 4/9/79

Test No. Preliminary - Inlet

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 89.6

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\overline{\sqrt{\Delta p}}$ = 1.02

Absolute pressure of stack gas in Hg = PS = 28.8

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.29

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{+460}{x}} \times \left(\quad \right) = \frac{55.9}{sec} \text{ ft}$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{+460}) \times (\frac{}{29.92}) = 61,600 \text{ scfm}$$

MOISTURE IN STACK GAS DETERMINATION

METHOD 4

Plant Texas Color

Run # Preliminary + Dry 1 Date 4/9

Location Sampled Outlet

Volume of gas at meter conditions (CF) = VM = 22.425 - 20.323 = 2.102

Average meter temperature (°F) = TM = 74°F

Barometric pressure absolute (in Hg) = PB = 29.04

VMS = Volume of gas sampled at standard conditions (SCF)

$$VMS = \frac{(17.64)(VM)(PB)}{(TM + 460)} = \frac{17.64\ (2.102)(29.04)}{(74 + 460)} = 2.009$$

Volume of water final _____ Wt. of silica gel final _____

Volume of water initial _____ Wt. of silica gel initial _____

Volume collected V_1 = _____ Wt. of water V_2 = 196.6 - 196.0 gm

Total volume of water collected (ml) = $V_1 + V_2$ = VL = 0.6

Volume of water vapor at standard conditions (CF) = VW

VW = (.0471)(VL) = .0471(0.6) = 0.02826

Mole fraction of water vapor = M

$$M = \frac{VW}{VMS + VW} = \frac{(.028)}{(2.009) + (.028)} = M = .014$$

Percent moisture = (100)(M) = 100 (.014) = %M 1.4

APPENDIX B

RUN VELOCITY DATA
INLET - (OUTLET) - ADSORBERS

In stack wet bulb-dry bulb moisture calculation:

Plant Texas Color Printers, Inc Location Inlet (Porter) Dallas, Tex

Stack Inlet - Porter Run Day 1 Date 4/10/79

Operators Tolkett

Barometric Pressure (Hg) = BP = 29.59 in Hg

Static Pressure (in H_2O) P = -2.6 in H_2O

Absolute Pressure of Stack =

$$BP \pm \frac{P}{13.6} = P_s = 29.40 \text{ in Hg}$$

Wet Bulb Temperature (°F) = T_W = 65°F °F

Dry Bulb Temperature (°F) = T_d = 90°F °F

Temp Difference ($T_d - T_W$) = ΔT = 25 °F

Vapor Pressure of H_2O at T_W (from table) VP = 0.6222 in Hg

Partial Pressure of H_2O = PP

$$PP = (\quad VP) - \frac{(P_s - VP)(\Delta T)}{2800 - (1.3)(T_W)}$$

$$PP = (.6222) - \frac{(29.40 - .62)(25)}{2800 - (1.3)(65)} = 0.357 \text{ in Hg}$$

% Moisture by volume = M

$$M = \frac{(PP)}{(P_s)}(100) = \frac{(.357)}{(29.40)}(100) = 1.2 \%$$

VAPOR PRESSURES OF WATER

°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg
0	.0376	33	.1878	53	.4052	73	.8183	93	1.561	113	2.829	133	4.900	153	8.150	173	13.07	193	20.27
2	.0417	34	.1955	54	.4203	74	.8462	94	1.610	114	2.911	134	5.031	154	8.351	174	13.37	194	20.70
4	.0463	35	.2035	55	.4359	75	.8750	95	1.660	115	2.995	135	5.165	155	8.557	175	13.67	195	21.14
6	.0517	36	.2118	56	.4520	76	.9046	96	1.712	116	3.081	136	5.302	156	8.767	176	13.98	196	21.59
8	.0571	37	.2203	57	.4686	77	.9352	97	1.765	117	3.169	137	5.442	157	8.981	177	14.30	197	22.05
10	.0631	38	.2292	58	.4858	78	.9666	98	1.819	118	3.259	138	5.585	158	9.200	178	14.62	198	22.52
12	.0696	39	.2383	59	.5035	79	.9989	99	1.875	119	3.351	139	5.732	159	9.424	179	14.96	199	22.99
14	.0768	40	.2478	60	.5218	80	1.032	100	1.932	120	3.446	140	5.881	160	9.652	180	15.29	200	23.47
16	.0846	41	.2576	61	.5407	81	1.066	101	1.992	121	3.543	141	6.034	161	9.885	181	15.63	201	23.96
18	.0932	42	.2677	62	.5601	82	1.102	102	2.052	122	3.642	142	6.190	162	10.12	182	15.98	202	24.46
20	.1025	43	.2782	63	.5802	83	1.138	103	2.114	123	3.744	143	6.350	163	10.36	183	16.34	203	24.97
22	.1127	44	.2891	64	.6009	84	1.175	104	2.178	124	3.848	144	6.513	164	10.61	184	16.70	204	25.48
24	.1248	45	.3004	65	.6222	85	1.213	105	2.243	125	3.954	145	6.680	165	10.86	185	17.07	205	26.00
26	.1370	46	.3120	66	.6442	86	1.253	106	2.310	126	4.063	146	6.850	166	11.12	186	17.44	206	26.53
27	.1429	47	.3240	67	.6669	87	1.293	107	2.379	127	4.174	147	7.024	167	11.38	187	17.82	207	27.07
28	.1502	48	.3364	68	.6903	88	1.335	108	2.449	128	4.289	148	7.202	168	11.65	188	18.21	208	27.62
29	.1567	49	.3493	69	.7144	89	1.378	109	2.521	129	4.406	149	7.384	169	11.92	189	18.61	209	28.18
30	.1647	50	.3626	70	.7392	90	1.422	110	2.596	130	4.525	150	7.569	170	12.20	190	19.01	210	28.75
31	.1716	51	.3764	71	.7648	91	1.467	111	2.672	131	4.647	151	7.759	171	12.48	191	19.42	211	29.33
32	.1803	52	.3906	72	.7912	92	1.513	112	2.749	132	4.772	152	7.952	172	12.77	192	19.84	212	29.92

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR PRINTERS

Date 4/11/79

Test No. 1 INLET FIXED POINT (AVG. VEL. POINT)

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 90

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 0.95

Absolute pressure of stack gas in Hg = PS = 29.59

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.2

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times .80 \times \sqrt{\frac{90+460}{29.59 \times 28.84}} \times (.95) = \frac{53.5}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- .012) \times 53.5 \times 20.13 \times (\frac{528}{90+460}) \times (\frac{29.59}{29.92}) = 60,600 \text{ scfm}$$

In stack wet bulb-dry bulb moisture calculation:

Plant Texas Color Pigments, Inc Location _____

Stack Inlet - Ports Run Day 2-3 Date 4/12/79

Operators Tackett

Barometric Pressure (Hg) = BP = 29.9 in Hg

Static Pressure (in H_2O) P = -2.6 in H_2O

Absolute Pressure of Stack =

$$BP \pm \frac{P}{13.6} = P_s = 29.7 \text{ in Hg}$$

Wet Bulb Temperature (°F) = T_W = 68 °F

Dry Bulb Temperature (°F) = T_d = 92 °F

Temp Difference ($T_d - T_W$) = ΔT = 24 °F

Vapor Pressure of H_2O at T_W (from table) VP = .6903 in Hg

Partial Pressure of H_2O = PP

$$PP = (\quad VP) - \frac{(P_s - VP)(\Delta T)}{2800 - (1.3)(T_W)}$$

$$PP = (.6903) - \frac{(29.7 - .6903)(24)}{2800 - (1.3)(68)} = .434 \text{ in Hg}$$

% Moisture by volume = M

$$M = \frac{(PP)}{(P_s)}(100) = \frac{(.434)}{(29.7)}(100) = 1.5 \%$$

VAPOR PRESSURES OF WATER

°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg
0	.0376	33	.1878	53	.4052	73	.8183	93	1.561	113	2.829	133	4.900	153	8.150	173	13.07	193	20.27
2	.0417	34	.1955	54	.4203	74	.8462	94	1.610	114	2.911	134	5.031	154	8.351	174	13.37	194	20.70
4	.0463	35	.2035	55	.4359	75	.8750	95	1.660	115	2.995	135	5.165	155	8.557	175	13.67	195	21.14
6	.0517	36	.2118	56	.4520	76	.9046	96	1.712	116	3.081	136	5.302	156	8.767	176	13.98	196	21.59
8	.0571	37	.2203	57	.4686	77	.9352	97	1.765	117	3.169	137	5.442	157	8.981	177	14.30	197	22.05
10	.0631	38	.2292	58	.4858	78	.9666	98	1.819	118	3.259	138	5.585	158	9.200	178	14.62	198	22.52
12	.0696	39	.2383	59	.5035	79	.9989	99	1.875	119	3.351	139	5.732	159	9.424	179	14.96	199	22.99
14	.0768	40	.2478	60	.5218	80	1.032	100	1.932	120	3.446	140	5.881	160	9.652	180	15.29	200	23.47
16	.0846	41	.2576	61	.5407	81	1.066	101	1.992	121	3.543	141	6.034	161	9.885	181	15.63	201	23.96
18	.0932	42	.2677	62	.5601	82	1.102	102	2.052	122	3.642	142	6.190	162	10.12	182	15.98	202	24.46
20	.1025	43	.2782	63	.5802	83	1.138	103	2.114	123	3.744	143	6.350	163	10.36	183	16.34	203	24.97
22	.1127	44	.2891	64	.6009	84	1.175	104	2.178	124	3.848	144	6.513	164	10.61	184	16.70	204	25.48
24	.1248	45	.3004	65	.6222	85	1.213	105	2.243	125	3.954	145	6.680	165	10.86	185	17.07	205	26.00
26	.1370	46	.3120	66	.6442	86	1.253	106	2.310	126	4.063	146	6.850	166	11.12	186	17.44	206	26.53
27	.1429	47	.3240	67	.6669	87	1.293	107	2.379	127	4.174	147	7.024	167	11.38	187	17.82	207	27.07
28	.1502	48	.3364	68	.6903	88	1.335	108	2.449	128	4.289	148	7.202	168	11.65	188	18.21	208	27.62
29	.1567	49	.3493	69	.7144	89	1.378	109	2.521	129	4.406	149	7.384	169	11.92	189	18.61	209	28.18
30	.1647	50	.3626	70	.7392	90	1.422	110	2.596	130	4.525	150	7.569	170	12.20	190	19.01	210	28.75
31	.1716	51	.3764	71	.7648	91	1.467	111	2.672	131	4.647	151	7.759	171	12.48	191	19.42	211	29.33
32	.1803	52	.3906	72	.7912	92	1.513	112	2.749	132	4.772	152	7.952	172	12.77	192	19.84	212	29.92

In stack wet bulb-dry bulb moisture calculation:

Plant Texas Color Printers, Inc Location Dallas, Texas

Stack Outlet Run Day 2+3 Date 4/[redacted]/79

Operators Tackett

Barometric Pressure (Hg) = BP = 29.9 in Hg

Static Pressure (in H_2O) P = – in H_2O

Absolute Pressure of Stack =

$$BP \pm \frac{P}{13.6} = P_s = 29.9 \text{ in Hg}$$

Wet Bulb Temperature (°F) = T_w = 67 °F

Dry Bulb Temperature (°F) = T_d = 89 °F

Temp Difference ($T_d - T_w$) = ΔT = 22 °F

Vapor Pressure of H_2O at T_w (from table) VP = .6669 in Hg

Partial Pressure of H_2O = PP

$$PP = (\quad VP) - \frac{(P_s - VP)(\Delta T)}{2800 - (1.3)(T_w)}$$

$$PP = (.6669) - \frac{(29.9)(22)}{2800 - (1.3)(67)} = .424 \text{ in Hg}$$

% Moisture by volume = M

$$M = \frac{(PP)}{(P_s)}(100) = \frac{(.427)}{(29.9)}(100) = 1.4 \%$$

VAPOR PRESSURES OF WATER

°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg
0	.0376	33	.1878	53	.4052	73	.8183	93	1.561	113	2.829	133	4.900	153	8.150	173	13.07	193	20.27
2	.0417	34	.1955	54	.4203	74	.8462	94	1.610	114	2.911	134	5.031	154	8.351	174	13.37	194	20.70
4	.0463	35	.2035	55	.4359	75	.8750	95	1.660	115	2.995	135	5.165	155	8.557	175	13.67	195	21.14
6	.0517	36	.2118	56	.4520	76	.9046	96	1.712	116	3.081	136	5.302	156	8.767	176	13.98	196	21.59
8	.0571	37	.2203	57	.4686	77	.9352	97	1.765	117	3.169	137	5.442	157	8.981	177	14.30	197	22.05
10	.0631	38	.2292	58	.4858	78	.9666	98	1.819	118	3.259	138	5.585	158	9.200	178	14.62	198	22.52
12	.0696	39	.2383	59	.5035	79	.9989	99	1.875	119	3.351	139	5.732	159	9.424	179	14.96	199	22.99
14	.0768	40	.2478	60	.5218	80	1.032	100	1.932	120	3.446	140	5.881	160	9.652	180	15.29	200	23.47
16	.0846	41	.2576	61	.5407	81	1.066	101	1.992	121	3.543	141	6.034	161	9.885	181	15.63	201	23.96
18	.0932	42	.2677	62	.5601	82	1.102	102	2.052	122	3.642	142	6.190	162	10.12	182	15.98	202	24.46
20	.1025	43	.2782	63	.5802	83	1.138	103	2.114	123	3.744	143	6.350	163	10.36	183	16.34	203	24.97
22	.1127	44	.2891	64	.6009	84	1.175	104	2.178	124	3.848	144	6.513	164	10.61	184	16.70	204	25.48
24	.1248	45	.3004	65	.6222	85	1.213	105	2.243	125	3.954	145	6.680	165	10.86	185	17.07	205	26.00
26	.1370	46	.3120	66	.6442	86	1.253	106	2.310	126	4.063	146	6.850	166	11.12	186	17.44	206	26.53
27	.1429	47	.3240	67	.6669	87	1.293	107	2.379	127	4.174	147	7.024	167	11.38	187	17.82	207	27.07
28	.1502	48	.3364	68	.6903	88	1.335	108	2.449	128	4.289	148	7.202	168	11.65	188	18.21	208	27.62
29	.1567	49	.3493	69	.7144	89	1.378	109	2.521	129	4.406	149	7.384	169	11.92	189	18.61	209	28.18
30	.1647	50	.3626	70	.7392	90	1.422	110	2.596	130	4.525	150	7.569	170	12.20	190	19.01	210	28.75
31	.1716	51	.3764	71	.7648	91	1.467	111	2.672	131	4.647	151	7.759	171	12.48	191	19.42	211	29.33
32	.1803	52	.3906	72	.7912	92	1.513	112	2.749	132	4.772	152	7.952	172	12.77	192	19.84	212	29.92

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/12/79

Test No. 2 INLET OVERALL VELOCITY

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 94.0

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.7

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{+460}{x}} \times \left(\quad \right) = \frac{54.8}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60x(1-(Mx10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60x(1- \quad)x \quad \times \quad x(\frac{528}{+460}) \times (\frac{\quad}{29.92}) = 61,700 \text{ scfm}$$

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/12/79

Test No. 3 INLET OVERALL VELOCITY

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 6.80

Temperature (average) of stack (°F) = TS = 94.8

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.7

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{\quad +460}{\quad}} \times (\quad) = \frac{54.7}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{\quad +460}) \times (\frac{\quad}{29.92}) = 61,400 \text{ scfm}$$

PRELIMINARY VELOCITY TRAVERSE

PLANT Texas Color
DATE 4/12/79
LOCATION Inlet to Absorbers
STACK I.D. 60 3/4"
BAROMETRIC PRESSURE, in. Hg 29.9
STACK GAUGE PRESSURE, in. H_2O -2.6
OPERATORS Stirling, Tackett

AAS #1 Absorbing #2 Absorbing #3 Steam
SAA #1 Steaming #2 Absorbing #3 Absorbing
ASA #1 Abs. #2 Steam. #3 Absorb.

(Data from average velocity point)

"Day 2"

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AAS	8:55	.72	94
	9:00	.90	94
	9:05	.90	95
	9:10	.94	92
	9:24	.96	95
ASA	10:35	.92	99
	10:45	1.00	99
	10:50	.98	98
	10:55	.94	98
	11:00	.92	98
	11:05	.94	97
SAA	12:00	.98	93
	12:05	.96	92
	12:10	.90	91
	12:15	.96	91
	12:20	.98	91
	12:25	.96	92
	12:30	.95	92
	12:35	.96	95
	AVERAGE		94.5

"Day 3"

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AAS	13:30	.88	89
	13:40	.96	86
	13:45	.94	85
	13:50	.94	84
	14:10	.96	94
ASA	15:03	.95	95
	15:10	.96	95
	15:16	.95	94
	15:20	.95	93
	15:35	.94	93
	15:40	.98	91
SAA	16:37	.98	98
	16:45	.96	98
	16:50	.94	98
	16:55	.90	98
	17:00	.98	97
	17:05	.92	96
	17:10	.95	96
	AVERAGE		93.3

$(\sqrt{\Delta P})_{av} = 0.97$ 94 =

EPA (Dur) 233
4/72

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR PRINTER, INC.

Date 4/12/79

Test No. DAY 2 INLET STEAM-ADSORBING CYCLES

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 94.5

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.7

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{\quad +460}{\quad}} \times \left(\quad \right) = \frac{53.5}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{+460}) \times (\frac{\quad}{29.92}) = 60{,}200 \text{ scfm}$$

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR PRINTERS

Date 4/12/79

Test No. DAY 3 INLET STEAM-ADSORBING CYCLES

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 93.3

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.7

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{+460}{x}} \times \left(\quad \right) = \frac{53.5}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{+460}) \times (\frac{\quad}{29.92}) = 60,300 \text{ scfm}$$

PRELIMINARY VELOCITY TRAVERSE

PLANT Texas Color
DATE 4/12/79
LOCATION Inlet to Absorbers
STACK I.D. 60"x4"
BAROMETRIC PRESSURE, in. Hg 29.9
STACK GAUGE PRESSURE, in. H_2O -2.6
OPERATORS Tackett, Sperling

AAD #1 Absorb. #2 Absorb. #3 Dry
DAA #1 Dry #2 Absorb #3 Absorb
ADA #1 Absorb #2 Dry #3 Absorb
(Data from Average Velocity Point)

SCHEMATIC OF TRAVERSE POINT LAYOUT

"Day 2"

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AAD ↓	9:40	1.22	94
	9:47	1.20	94
	9:51	1.22	94
ADA ↓	11:15	1.22	96
	11:20	1.25	94
DAA ↓	12:40	1.16	93
	12:45	1.20	92
	12:50	1.20	93
AVERAGE			94

"Day 3"

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AAD ↓	14:14	1.20	93
	14:24	1.28	94
ADA ↓	15:50	1.22	96
	15:55	1.22	97
DAA ↓	17:15	1.15	95
	17:20	1.20	95
	17:25	1.16	95
AVERAGE			

$(\sqrt{\Delta p})_{AV} = 1.10$ 94 °F

EPA (Dur) 233
4/72

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/12/79

Test No. 3 INLET DRYING CYCLES

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 95

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.7

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{+460}{x}} \times \left(\quad \right) = \frac{60.4}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{+460}) \times (\frac{}{29.92}) = 67,900 \text{ scfm}$$

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/12/79

Test No. 2 INLET DRYING CYCLES

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 94

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.7

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{\quad +460}{\quad}} \times (\quad) = \frac{60.5}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{\quad +460}) \times (\frac{\quad}{29.92}) = 68,100 \text{ scfm}$$

PRELIMINARY VELOCITY TRAVERSE

PLANT Texas Color
DATE 4/12/79
LOCATION Inlet to Adsorbers
STACK I.D. 60 3/4"
BAROMETRIC PRESSURE, in. Hg 29.4
STACK GAUGE PRESSURE, in. H_2O -2.6
OPERATORS Tackett, Sterling

AAI #1 Adsorb #2 Adsorb #3 Idle
IAA #1 Idle #2 Adsorb #3 Adsorb
AIA #1 Adsorb #2 Idle #3 Adsorb

(Data from average velocity point)

SCHEMATIC OF TRAVERSE POINT LAYOUT

"Day 2"

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AAI	9:55	.90	95
	10:00	.98	96
	10:05	.92	96
AIA	11:25	.90	98
	11:30	.90	92
	11:35	.94	91
	11:50	.90	96
IAA	13:00	.96	93
	13:05	1.00	92
	13:10	.96	92
	13:15	.96	92
	13:20	.96	90
	13:25	.96	90
	AVERAGE		93.3

"Day 3"

	TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AAI	14:30	.95	96
	14:35	.96	95
	14:47	.95	95
	14:58	.95	96
AIA	16:00	.90	99
	16:05	.90	99
	16:10	.96	96
	16:15	.90	98
	16:20	.90	100
	16:25	.94	100
IAA	17:30	.96	95
	17:35	.96	95
	17:40	.96	95
	17:45	.94	94
	17:50	.94	94
	AVERAGE		96.5

$(\sqrt{\Delta p})_{av} = 0.97$ 94 °F

EPA (Dur) 233
4/72

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/12/79

Test No. 2 INLET IDLE CYCLES

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 93.3

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.7

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{+460}{x}} \times \left(\quad \right) = \frac{53.3}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60x(1-(Mx10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60x(1- \quad)x \quad \times \quad x(\frac{528}{+460}) \times (\frac{}{29.92}) = 60,100 \text{ scfm}$$

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/12/79

Test No. 3 INLET IDLE CYCLES

Area of stack (ft^2) = A = 20.13

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.80

Temperature (average) of stack (°F) = TS = 96.5

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.7

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{+460}{x}} \times \left(\quad \right) = \frac{53.4}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{+460}) \times (\frac{}{29.92}) = 59,800 \text{ scfm}$$

APPENDIX C

PRELIMINARY AND RUN VELOCITY DATA

INLET DAMPER

NE VENT (UPTAKE)

SW VENT (UPTAKE)

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Texas Color
DATE 4/9/79
SAMPLING LOCATION Inlet Damper
INSIDE OF FAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE A) —
INSIDE OF NEAR WALL TO
OUTSIDE OF NIPPLE, (DISTANCE B) —
STACK I.D., (DISTANCE A - DISTANCE B) 36"
NEAREST UPSTREAM DISTURBANCE None (End of Pipe)
NEAREST DOWNSTREAM DISTURBANCE 101
CALCULATOR

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8 INCH)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	0.044	36"	1.58	—	1 5/8
2	0.146	↓	5.25	—	5 1/4
3	0.296		10.66	—	10 5/8
4	0.704		25.34	—	25 3/8
5	0.854		30.74	—	30 3/4
6	0.956		34.42	—	34 3/8

EPA (Dur) 232
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Texas Color Printers, Inc.
DATE 4/29/79
LOCATION Inlet - Damper (Prelim Day 1)
STACK I.D. 36"
BAROMETRIC PRESSURE, in. Hg 28.90
STACK GAUGE PRESSURE, in. H_2O 0
OPERATORS Tackett

Vane Anemometer

High Winds

Top ↓

TRAVERSE POINT NUMBER	~~VELOCITY HEAD (Δp_s), in. H_2O~~	STACK TEMPERATURE (T_s), °F
1	437/0.5	75
2	418/0.5	
3	464/0.5	
4	475/0.5	
5	446/0.5	
6	327/0.5	
Corrected	ft/min	Ambient
1	847	75
2	809	
3	901	
4	923	
5	865	
6	628	
AVERAGE		

SCHEMATIC OF TRAVERSE POINT LAYOUT

Side →

TRAVERSE POINT NUMBER	~~VELOCITY HEAD (Δp_s), in. H_2O~~	STACK TEMPERATURE (T_s), °F
7	196/0.5	75
8	255/0.5	
9	383/0.5	
10	525/0.5	
11	452/0.5	
12	404/0.5	
7	367	75
8	484	
9	740	
10	1023	
11	977	
12	881	
AVERAGE	787	75

787/60 = 13.1

EPA (Dur) 233
4/72

PRELIMINARY VELOCITY TRAVERSE

PLANT Texas Color
DATE 4/12/74
LOCATION Inlet - Damper 2,2+3
STACK I.D. 36"
BAROMETRIC PRESSURE, in. Hg 29.4
STACK GAUGE PRESSURE, in. H_2O 0
OPERATORS Tockett

Vane Anometer

Top

TRAVERSE POINT NUMBER	~~VELOCITY HEAD (Δp_s), in. H_2O~~	STACK TEMPERATURE (T_s), °F
1	1250/2	75
2	1254/2	
3	1212/2	
4	1268/2	
5	1508/2	
6	1218/2	
Uncorrected		
1	625	75
2	627	
3	606	
4	634	
5	754	
6	604	
Corrected		
1	599	75
2	601	
3	580	
4	608	
5	728	
6	583	
AVERAGE		

SCHEMATIC OF TRAVERSE POINT LAYOUT

Side

TRAVERSE POINT NUMBER	~~VELOCITY HEAD (Δp_s), in. H_2O~~	STACK TEMPERATURE (T_s), °F
1	1100/2	75
2	524/1	
3	640/1	
4	620/1	
5	848/1	
6	270/1	
1	550	75
2	524	
3	640	
4	620	
5	848	
6	270	
1	524	75
2	498	
3	614	
4	594	
5	821	
6	245	
AVERAGE	583 ft/min	75

583/60 = 9.7 ft/sec

EPA (Dur) 233
4/72

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR PRINTERS

Date 4/9/79

Test No. Preliminary - Inlet Damper (Vane Anometer)

Area of stack (ft^2) = A = 7.07

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = —

Temperature (average) of stack (°F) = TS = 75

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = —

Absolute pressure of stack gas in Hg = PS = 28.90

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.4

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{+460}{x}} \times \left(\quad \right) = \frac{13.1}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{+460}) \times (\frac{}{29.92}) = 5220 \text{ scfm}$$

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR PRINTERS

Date 4/12/79

Test No. RUN 2,3 INLET DAMPER (VANE ANEMETER)

Area of stack (ft^2) = A = 7.07

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = —

Temperature (average) of stack (°F) = TS = 75

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = —

Absolute pressure of stack gas in Hg = PS = 29.9

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.5

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{\quad +460}{\quad}} \times (\quad) = \frac{9.7}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60 \times (1-(M \times 10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60 \times (1- \quad) \times \quad \times \quad \times (\frac{528}{+460}) \times (\frac{\quad}{29.92}) = 3860 \text{ scfm}$$

TRAVERSE POINT LOCATIONS FOR RECTANGULAR DUCTS

PLANT Texas Color

DATE 4/9/79

SAMPLING LOCATION N.E. Vent (FLOOR SWEEP)

INSIDE STACK DIMENSIONS 40 x 24

INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (Distance B) —

EQUIVALENT STACK I.D. 30

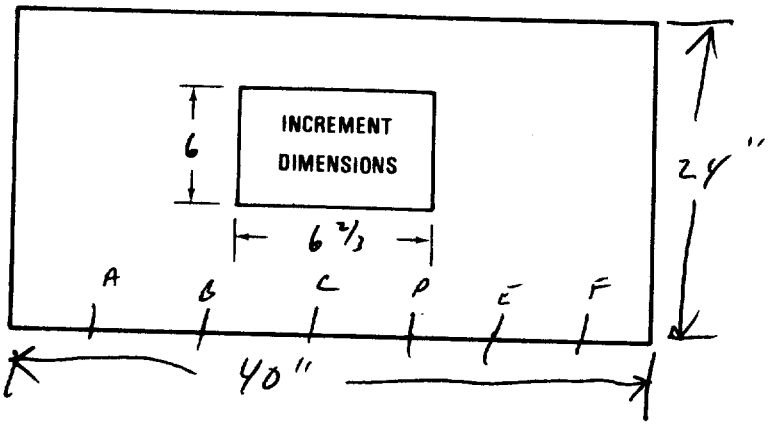
NEAREST UPSTREAM DISTURBANCE — 0" Expansion

NEAREST DOWNSTREAM DISTURBANCE 18"

NUMBER OF TRAVERSE POINTS 24 ARRAY 6 x 4

CALCULATOR Tackett

ILLUSTRATE PORT LOCATIONS AND STACK DIMENSIONS



TRAVERSE POINT NUMBER	INSIDE OF NEAR WALL TO TRAVERSE POINT (Distance A)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF DISTANCES A+B)	PORT LOCATION	DISTANCE FROM EDGE OF STACK
1	3"	—	3"	A	3.33
2	9"	—	9"	B	10.0
3	15"	—	15"	C	16.66
4	21"	—	21"	D	23.33
				E	30.0
				F	36.66

In stack wet bulb-dry bulb moisture calculation:

Plant Texas Color Location

Stack NE Vent Run Day 1 Date 4/11/79

Operators Tackett

Barometric Pressure (Hg) = BP = 29.59 in Hg

Static Pressure (in H_2O) P = -1.80 in H_2O

Absolute Pressure of Stack =

$$BP \pm \frac{P}{13.6} = \quad P_s = 29.46 \text{ in Hg}$$

Wet Bulb Temperature (°F) = T_W = 61 °F

Dry Bulb Temperature (°F) = T_d = 77 °F

Temp Difference ($T_d - T_W$) = ΔT = 16 °F

Vapor Pressure of H_2O at T_W (from table) VP = .5407 in Hg

Partial Pressure of H_2O = PP

$$PP = (\quad VP) - \frac{(P_s - VP)\ (\Delta T)}{2800 - (1.3)(T_W)}$$

$$PP = (\ .5407\ ) - \frac{(29.46 - .5407)(\ 16\ )}{2800 - (1.3)(\ 61\ )} = .371 \text{ in Hg}$$

% Moisture by volume = M

$$M = \frac{(PP)}{(P_s)}(100) = \frac{(\ .371\ )}{(\ 29.46\ )}(100) = 1.3\ \%$$

VAPOR PRESSURES OF WATER

°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg
0	.0376	33	.1878	53	.4052	73	.8183	93	1.561	113	2.829	133	4.900	153	8.150	173	13.07	193	20.27
2	.0417	34	.1955	54	.4203	74	.8462	94	1.610	114	2.911	134	5.031	154	8.351	174	13.37	194	20.70
4	.0463	35	.2035	55	.4359	75	.8750	95	1.660	115	2.995	135	5.165	155	8.557	175	13.67	195	21.14
6	.0517	36	.2118	56	.4520	76	.9046	96	1.712	116	3.081	136	5.302	156	8.767	176	13.98	196	21.59
8	.0571	37	.2203	57	.4686	77	.9352	97	1.765	117	3.169	137	5.442	157	8.981	177	14.30	197	22.05
10	.0631	38	.2292	58	.4858	78	.9666	98	1.819	118	3.259	138	5.585	158	9.200	178	14.62	198	22.52
12	.0696	39	.2383	59	.5035	79	.9989	99	1.875	119	3.351	139	5.732	159	9.424	179	14.96	199	22.99
14	.0768	40	.2478	60	.5218	80	1.032	100	1.932	120	3.446	140	5.881	160	9.652	180	15.29	200	23.47
16	.0846	41	.2576	61	.5407	81	1.066	101	1.992	121	3.543	141	6.034	161	9.885	181	15.63	201	23.96
18	.0932	42	.2677	62	.5601	82	1.102	102	2.052	122	3.642	142	6.190	162	10.12	182	15.98	202	24.46
20	.1025	43	.2782	63	.5802	83	1.138	103	2.114	123	3.744	143	6.350	163	10.36	183	16.34	203	24.97
22	.1127	44	.2891	64	.6009	84	1.175	104	2.178	124	3.848	144	6.513	164	10.61	184	16.70	204	25.48
24	.1248	45	.3004	65	.6222	85	1.213	105	2.243	125	3.954	145	6.680	165	10.86	185	17.07	205	26.00
26	.1370	46	.3120	66	.6442	86	1.253	106	2.310	126	4.063	146	6.850	166	11.12	186	17.44	206	26.53
27	.1429	47	.3240	67	.6669	87	1.293	107	2.379	127	4.174	147	7.024	167	11.38	187	17.82	207	27.07
28	.1502	48	.3364	68	.6903	88	1.335	108	2.449	128	4.289	148	7.202	168	11.65	188	18.21	208	27.62
29	.1567	49	.3493	69	.7144	89	1.378	109	2.521	129	4.406	149	7.384	169	11.92	189	18.61	209	28.18
30	.1647	50	.3626	70	.7392	90	1.422	110	2.596	130	4.525	150	7.569	170	12.20	190	19.01	210	28.75
31	.1716	51	.3764	71	.7648	91	1.467	111	2.672	131	4.647	151	7.759	171	12.48	191	19.42	211	29.33
32	.1803	52	.3906	72	.7912	92	1.513	112	2.749	132	4.772	152	7.952	172	12.77	192	19.84	212	29.92

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/11/79

Test No. 1 NE VENT (FLOOR SWEEP)

Area of stack (ft^2) = A = 6.67

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.73

Temperature (average) of stack (°F) = TS = 77.3

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = _____

Absolute pressure of stack gas in Hg = PS = 29.46

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.3

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{\quad +460}{\quad x}} \times \left(\quad \right) = \frac{20.1}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60x(1-(Mx10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60x(1- \quad)x \quad x \quad x(\frac{528}{+460}) \times (\frac{}{29.92}) = 7690 \text{ scfm}$$

PRELIMINARY VELOCITY TRAVERSE

PLANT Texas Color
DATE 4/11/79
LOCATION NE Vent Dayl
STACK I.D. 24×40
BAROMETRIC PRESSURE, in. Hg 29.59
STACK GAUGE PRESSURE, in. H_2O −1.80"
OPERATORS Tockett

$c_p = 0.73$

SCHEMATIC OF TRAVERSE POINT LAYOUT

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A1	.16	78
A2	.12	78
A3	.12	78
* A4	.17	78
B1	.19	77
B2	.20	77
B3	.20	77
B4	.19	77
C1	.20	77
C2	.20	77
C3	.19	77
C4	.19	77
D1	.15	77
D2	.20	77
D3	.20	77
D4	.19	76
E1	.13	78
E2	.19	76
E3	.19	78
E4	.18	78
F1	.07	77
F2	.09	77
F3	.13	77
F4	.15	77
AVERAGE		77.3

$(\sqrt{\Delta p})_{AV} = 0.41$
AVG = .17

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

EPA (Dur) 233
4/72

In stack wet bulb-dry bulb moisture calculation:

Plant Texas Color Printers, Inc Location _____

Stack N E Vent Run Day 2+3 Date 4/12/94

Operators Tackett

Barometric Pressure (Hg) = BP = 29.4 in Hg

Static Pressure (in H_2O) P = -1.70 in H_2O

Absolute Pressure of Stack =

$$BP \pm \frac{P}{13.6} = P_s = 29.4 \text{ in Hg}$$

Wet Bulb Temperature (°F) = T_W = 62 °F

Dry Bulb Temperature (°F) = T_d = 80 °F

Temp Difference (T_d-T_W) = ΔT = 18 °F

Vapor Pressure of H_2O at T_W (from table) VP = .5601 in Hg

Partial Pressure of H_2O = PP

$$PP = (\quad VP) - \frac{(P_s - VP)\ (\Delta T)}{2800 - (1.3)(T_W)}$$

$$PP = (.5601) - \frac{(29.8 - .5601)(18)}{2800 - (1.3)(62)} = .367 \text{ in Hg}$$

% Moisture by volume = M

$$M = \frac{(PP)}{(P_s)}(100) = \frac{(.367)}{(29.8)}(100) = 1.2\ \%$$

VAPOR PRESSURES OF WATER

°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg
0	.0376	33	.1878	53	.4052	73	.8183	93	1.561	113	2.829	133	4.900	153	8.150	173	13.07	193	20.27
2	.0417	34	.1955	54	.4203	74	.8462	94	1.610	114	2.911	134	5.031	154	8.351	174	13.37	194	20.70
4	.0463	35	.2035	55	.4359	75	.8750	95	1.660	115	2.995	135	5.165	155	8.557	175	13.67	195	21.14
6	.0517	36	.2118	56	.4520	76	.9046	96	1.712	116	3.081	136	5.302	156	8.767	176	13.98	196	21.59
8	.0571	37	.2203	57	.4686	77	.9352	97	1.765	117	3.169	137	5.442	157	8.981	177	14.30	197	22.05
10	.0631	38	.2292	58	.4858	78	.9666	98	1.819	118	3.259	138	5.585	158	9.200	178	14.62	198	22.52
12	.0696	39	.2383	59	.5035	79	.9989	99	1.875	119	3.351	139	5.732	159	9.424	179	14.96	199	22.99
14	.0768	40	.2478	60	.5218	80	1.032	100	1.932	120	3.446	140	5.881	160	9.652	180	15.29	200	23.47
16	.0846	41	.2576	61	.5407	81	1.066	101	1.992	121	3.543	141	6.034	161	9.885	181	15.63	201	23.96
18	.0932	42	.2677	62	.5601	82	1.102	102	2.052	122	3.642	142	6.190	162	10.12	182	15.98	202	24.46
20	.1025	43	.2782	63	.5802	83	1.138	103	2.114	123	3.744	143	6.350	163	10.36	183	16.34	203	24.97
22	.1127	44	.2891	64	.6009	84	1.175	104	2.178	124	3.848	144	6.513	164	10.61	184	16.70	204	25.48
24	.1248	45	.3004	65	.6222	85	1.213	105	2.243	125	3.954	145	6.680	165	10.86	185	17.07	205	26.00
26	.1370	46	.3120	66	.6442	86	1.253	106	2.310	126	4.063	146	6.850	166	11.12	186	17.44	206	26.53
27	.1429	47	.3240	67	.6669	87	1.293	107	2.379	127	4.174	147	7.024	167	11.38	187	17.82	207	27.07
28	.1502	48	.3364	68	.6903	88	1.335	108	2.449	128	4.289	148	7.202	168	11.65	188	18.21	208	27.62
29	.1567	49	.3493	69	.7144	89	1.378	109	2.521	129	4.406	149	7.384	169	11.92	189	18.61	209	28.18
30	.1647	50	.3626	70	.7392	90	1.422	110	2.596	130	4.525	150	7.569	170	12.20	190	19.01	210	28.75
31	.1716	51	.3764	71	.7648	91	1.467	111	2.672	131	4.647	151	7.759	171	12.48	191	19.42	211	29.33
32	.1803	52	.3906	72	.7912	92	1.513	112	2.749	132	4.772	152	7.952	172	12.77	192	19.84	212	29.92

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/12/79

Test No. R2,3 N.E. VENT (FLOOR SWEEP) FIXED @ POINT A-4

Area of stack (ft^2) = A = 6.667

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.73

Temperature (average) of stack (°F) = TS = 80

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = ΔP = .17

Absolute pressure of stack gas in Hg = PS = 29.8

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.2

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{\quad +460}{\quad x}} \times \left(\quad \right) = \frac{20.4}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60x(1-(Mx10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60x(1- \quad)x \quad x \quad x(\frac{528}{\quad +460}) \times (\frac{\quad}{29.92}) = 7850 \text{ scfm}$$

TRAVERSE POINT LOCATIONS FOR RECTANGULAR DUCTS

PLANT Texas Cdor

DATE 4/9/79

SAMPLING LOCATION SW vent (FLOOR SWEEP)

INSIDE STACK DIMENSIONS 36" x 30"

INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (Distance B) —

EQUIVALENT STACK I.D. 32.7"

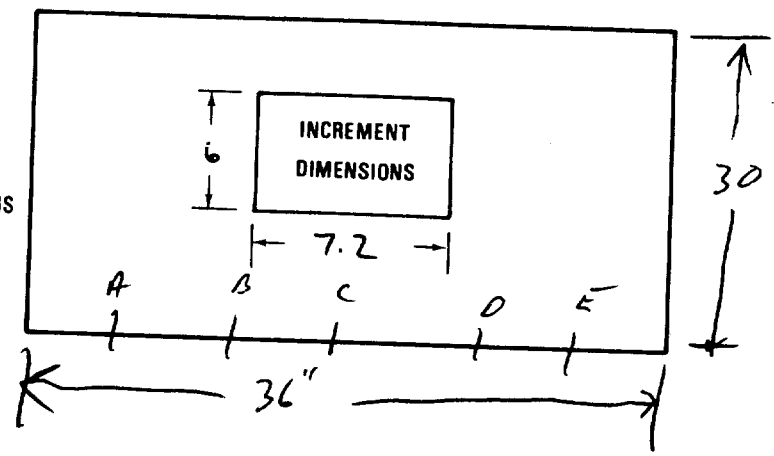
NEAREST UPSTREAM DISTURBANCE — (>.55DD for Downstream)

NEAREST DOWNSTREAM DISTURBANCE 1.5' (18") .55 D.D.

NUMBER OF TRAVERSE POINTS 25 ARRAY 5 x 5

CALCULATOR Tackett

ILLUSTRATE PORT LOCATIONS AND STACK DIMENSIONS



TRAVERSE POINT NUMBER	INSIDE OF NEAR WALL TO TRAVERSE POINT (Distance A)	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF DISTANCES A+B)	PORT LOCATION	DISTANCE FROM EDGE OF STACK
1	3"	—		A	3.6
2	9"	—		B	10.8
3	15"	—		C	18.0
4	21"	—		D	25.2
5	27"	—		E	32.4

PRELIMINARY VELOCITY TRAVERSE

PLANT Texas Color Printers

DATE 4/11/79 Day 1

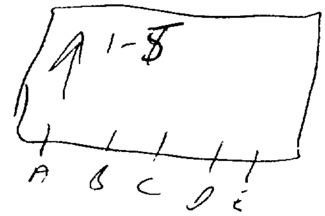
LOCATION SW Vent

STACK I.D. 36×30

BAROMETRIC PRESSURE, in. Hg 29.59

STACK GAUGE PRESSURE, in. H_2O −0.85

OPERATORS Tockett



SCHEMATIC OF TRAVERSE POINT LAYOUT

Cp=0.73

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A 1	.07	76
A 2	.10	76
A 3	.10	76
A4	.07	76
A 5	.07	76
B4	.19	77
B3	.24	76
B2	.25	76
B1	.15	76
B 5	.15	76
C4	.34	76
C3	.34	76
C2	.34	76
C1	.25	76
C 5	.32	75
D1	.26	75
D2	.35	75
D3	.34	75
D4	.32	75
D5	.32	75
E 1	0.23	75
E 2	0.31	75
E3	0.29	75
E 4	0.28	75
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
* E5	0.21	74
	$(\sqrt{\Delta p})_{av}$ = 0.47	75.6
AVERAGE		

EPA (Dur) 233
4/72

In stack wet bulb-dry bulb moisture calculation:

Plant Texas Color Location

Stack SW Vent Run Day 1 Date 4/10/79

Operators Tackett

Barometric Pressure (Hg) = BP = 29.59 in Hg

Static Pressure (in H_2O) P = -.85 in H_2O

Absolute Pressure of Stack =

$$BP \pm \frac{P}{13.6} = P_s = 29.53 \text{ in Hg}$$

Wet Bulb Temperature (°F) = T_W = 59 °F

Dry Bulb Temperature (°F) = T_d = 75 °F

Temp Difference (T_d-T_W) = ΔT = 16 °F

Vapor Pressure of H_2O at T_W (from table) VP = .5035 in Hg

Partial Pressure of H_2O = PP

$$PP = (\quad VP) - \frac{(P_s - VP)(\Delta T)}{2800 - (1.3)(T_W)}$$

$$PP = (.5035) - \frac{(29.53 - .5035)(16)}{2800 - (1.3)(59)} = .333 \text{ in Hg}$$

% Moisture by volume = M

$$M = \left(\frac{PP}{P_s}\right)(100) = \left(\frac{.333}{29.53}\right)(100) = 1.1 \%$$

VAPOR PRESSURES OF WATER

°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg
0	.0376	33	.1878	53	.4052	73	.8183	93	1.561	113	2.829	133	4.900	153	8.150	173	13.07	193	20.27
2	.0417	34	.1955	54	.4203	74	.8462	94	1.610	114	2.911	134	5.031	154	8.351	174	13.37	194	20.70
4	.0463	35	.2035	55	.4359	75	.8750	95	1.660	115	2.995	135	5.165	155	8.557	175	13.67	195	21.14
6	.0517	36	.2118	56	.4520	76	.9046	96	1.712	116	3.081	136	5.302	156	8.767	176	13.98	196	21.59
8	.0571	37	.2203	57	.4686	77	.9352	97	1.765	117	3.169	137	5.442	157	8.981	177	14.30	197	22.05
10	.0631	38	.2292	58	.4858	78	.9666	98	1.819	118	3.259	138	5.585	158	9.200	178	14.62	198	22.52
12	.0696	39	.2383	59	.5035	79	.9989	99	1.875	119	3.351	139	5.732	159	9.424	179	14.96	199	22.99
14	.0768	40	.2478	60	.5218	80	1.032	100	1.932	120	3.446	140	5.881	160	9.652	180	15.29	200	23.47
16	.0846	41	.2576	61	.5407	81	1.066	101	1.992	121	3.543	141	6.034	161	9.885	181	15.63	201	23.96
18	.0932	42	.2677	62	.5601	82	1.102	102	2.052	122	3.642	142	6.190	162	10.12	182	15.98	202	24.46
20	.1025	43	.2782	63	.5802	83	1.138	103	2.114	123	3.744	143	6.350	163	10.36	183	16.34	203	24.97
22	.1127	44	.2891	64	.6009	84	1.175	104	2.178	124	3.848	144	6.513	164	10.61	184	16.70	204	25.48
24	.1248	45	.3004	65	.6222	85	1.213	105	2.243	125	3.954	145	6.680	165	10.86	185	17.07	205	26.00
26	.1370	46	.3120	66	.6442	86	1.253	106	2.310	126	4.063	146	6.850	166	11.12	186	17.44	206	26.53
27	.1429	47	.3240	67	.6669	87	1.293	107	2.379	127	4.174	147	7.024	167	11.38	187	17.82	207	27.07
28	.1502	48	.3364	68	.6903	88	1.335	108	2.449	128	4.289	148	7.202	168	11.65	188	18.21	208	27.62
29	.1567	49	.3493	69	.7144	89	1.378	109	2.521	129	4.406	149	7.384	169	11.92	189	18.61	209	28.18
30	.1647	50	.3626	70	.7392	90	1.422	110	2.596	130	4.525	150	7.569	170	12.20	190	19.01	210	28.75
31	.1716	51	.3764	71	.7648	91	1.467	111	2.672	131	4.647	151	7.759	171	12.48	191	19.42	211	29.33
32	.1803	52	.3906	72	.7912	92	1.513	112	2.749	132	4.772	152	7.952	172	12.77	192	19.84	212	29.92

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/11/79

Test No. 1 SW Vent (FLOOR SWEEP)

Area of stack (ft^2) = A = 7.5

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.73

Temperature (average) of stack (°F) = TS = 75.6

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = $\Delta P = .24$

Absolute pressure of stack gas in Hg = PS. = 29.53

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.1

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{\quad +460}{\quad x}} \times \left(\quad \right) = \frac{23.4}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60x(1-(Mx10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60x(1- \quad)x \quad x \quad x(\frac{528}{+460}) \times (\frac{\quad}{29.92}) = 10,100 \text{ scfm}$$

In stack wet bulb-dry bulb moisture calculation:

Plant Texas Color Printers, Ink Location

Stack SW vent Run Day 2+3 Date 4/12/79

Operators Tackett

Barometric Pressure (Hg) = BP = 29.9 in Hg

Static Pressure (in H_2O) P = -.73 in H_2O

Absolute Pressure of Stack =

$$BP \pm \frac{P}{13.6} = P_s = 29.8 \text{ in Hg}$$

Wet Bulb Temperature (°F) = T_W = 62 °F

Dry Bulb Temperature (°F) = T_d = 79 °F

Temp Difference (T_d-T_W) = ΔT = 17 °F

Vapor Pressure of H_2O at T_W (from table) VP = .5601 in Hg

Partial Pressure of H_2O = PP

$$PP = (\quad VP) - \frac{(P_s - VP)\ (\Delta T)}{2800 - (1.3)(\ T_W\ )}$$

$$PP = (\ .5601\ ) - \frac{(29.8 - .5601)(\ 17\ )}{2800 - (1.3)(\ 62\ )} = .377 \text{ in Hg}$$

% Moisture by volume = M

$$M = \frac{(PP\qquad)}{(P_s\qquad)}(100) = \frac{(\ .377\ )}{(\ 29.8\ )}(100) = 1.3\ \%$$

VAPOR PRESSURES OF WATER

°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg	°F	"Hg
0	.0376	33	.1878	53	.4052	73	.8183	93	1.561	113	2.829	133	4.900	153	8.150	173	13.07	193	20.27
2	.0417	34	.1955	54	.4203	74	.8462	94	1.610	114	2.911	134	5.031	154	8.351	174	13.37	194	20.70
4	.0463	35	.2035	55	.4359	75	.8750	95	1.660	115	2.995	135	5.165	155	8.557	175	13.67	195	21.14
6	.0517	36	.2118	56	.4520	76	.9046	96	1.712	116	3.081	136	5.302	156	8.767	176	13.98	196	21.59
8	.0571	37	.2203	57	.4686	77	.9352	97	1.765	117	3.169	137	5.442	157	8.981	177	14.30	197	22.05
10	.0631	38	.2292	58	.4858	78	.9666	98	1.819	118	3.259	138	5.585	158	9.200	178	14.62	198	22.52
12	.0696	39	.2383	59	.5035	79	.9989	99	1.875	119	3.351	139	5.732	159	9.424	179	14.96	199	22.99
14	.0768	40	.2478	60	.5218	80	1.032	100	1.932	120	3.446	140	5.881	160	9.652	180	15.29	200	23.47
16	.0846	41	.2576	61	.5407	81	1.066	101	1.992	121	3.543	141	6.034	161	9.885	181	15.63	201	23.96
18	.0932	42	.2677	62	.5601	82	1.102	102	2.052	122	3.642	142	6.190	162	10.12	182	15.98	202	24.46
20	.1025	43	.2782	63	.5802	83	1.138	103	2.114	123	3.744	143	6.350	163	10.36	183	16.34	203	24.97
22	.1127	44	.2891	64	.6009	84	1.175	104	2.178	124	3.848	144	6.513	164	10.61	184	16.70	204	25.48
24	.1248	45	.3004	65	.6222	85	1.213	105	2.243	125	3.954	145	6.680	165	10.86	185	17.07	205	26.00
26	.1370	46	.3120	66	.6442	86	1.253	106	2.310	126	4.063	146	6.850	166	11.12	186	17.44	206	26.53
27	.1429	47	.3240	67	.6669	87	1.293	107	2.379	127	4.174	147	7.024	167	11.38	187	17.82	207	27.07
28	.1502	48	.3364	68	.6903	88	1.335	108	2.449	128	4.289	148	7.202	168	11.65	188	18.21	208	27.62
29	.1567	49	.3493	69	.7144	89	1.378	109	2.521	129	4.406	149	7.384	169	11.92	189	18.61	209	28.18
30	.1647	50	.3626	70	.7392	90	1.422	110	2.596	130	4.525	150	7.569	170	12.20	190	19.01	210	28.75
31	.1716	51	.3764	71	.7648	91	1.467	111	2.672	131	4.647	151	7.759	171	12.48	191	19.42	211	29.33
32	.1803	52	.3906	72	.7912	92	1.513	112	2.749	132	4.772	152	7.952	172	12.77	192	19.84	212	29.92

METHOD 2

STACK GAS VELOCITY CALCULATIONS

Plant TEXAS COLOR

Date 4/11/79

Test No. 2+3 SW Vent (FLOOR SWEEP)

Area of stack (ft^2) = A = 7.5

note $A = \pi r^2$ fw r = feet or $A = \pi(\frac{r}{12})^2$ of r in inches

Pitot tube coefficient, type S = CP = 0.73

Temperature (average) of stack (°F) = TS = 79

Average of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = ΔP = .31

Absolute pressure of stack gas in Hg = PS. = 29.87

note PS = Barometric pressure (in Hg)-(static pressure (in H_2O)/13.6)

Percent moisture = M = 1.3

Molecular weight of stack gas - (lbs/lb mole) = MS = 28.84

note $MS = MD(1 - \frac{M}{100}) + 18(\frac{M}{100})$

VS = stack gas velocity (f.p.s.)

$$VS = 85.49 \times CP \times \sqrt{\frac{TS+460}{PS \times MS}} \times (\sqrt{\Delta p})ave$$

$$VS = 85.49 \times \quad \times \sqrt{\frac{+460}{x}} \times \left(\quad \right) = \frac{27.5}{sec} ft$$

Q_S = volumetric flow rate (SCFM)

$$Q_S = 60x(1-(Mx10^{-2}))VS \times A \times (\frac{528}{TS+460}) \times (\frac{PS}{29.92})$$

$$Q_S = 60x(1- \quad)x \quad x \quad x(\frac{528}{+460}) \times (\frac{\quad}{29.92}) = 11,900 \text{ scfm}$$

APPENDIX D

METER READINGS
PRESS #1

Initial
INK METER READING

DATE 4/11/79 TIME 3:00 to 3:10 RUN NO Day 1

PRESS NO. 1 RECOVERY METER 8261.4 DECANTER 20686

FOUNTAIN	INK.	VARNISH	SOLVENT		
1	110390	11513	109054		
2	73511	7492	103270		
3	98955	5665	123273		
4	50970	4997	99810		
5	—	—	—		
6	107196	9633	216059		
7	71171	8532	114998		
8	72735	6515	109645		
9	46674	4257	102249		
10	—	—	—		
11					
12					

Final

INK METER READING

DATE 4/11/79 TIME 720-735 RUN NO Day 1

PRESS NO. 1 RECOVERY METER 8926.3 DECANTER (21545)*

* check with Terry Cole

Gallons Run #1

FOUNTAIN	INK.	VARNISH	SOLVENT	Ink USED	VARNISH USED	SOLVENT USED
1	110474	11515	109148	84	2	94
2	73550	7492	103311	39	0	41
3	98978	5671	123308	23	6	35
4	50991	4997	99834	21	0	24
5	—	—	—	—	—	—
6	107253	9643	216146	57	10	87
7	71211	8532	115041	40	0	43
8	72767	6515	109660	32	0	15
9	46696	4257	102277	22	0	28
10	—	—	—	—	—	—
11						
12						
					Decantor	859
					Recovery meter	664.9

Initial

INK METER READING

DATE 4/12/79 TIME 8:55 ~ 9:10 RUN NO Day 2

PRESS NO. 1 RECOVERY METER 0934 DECANTER 24060

FOUNTAIN	INK.	VARNISH	SOLVENT		
1	110604	11516	109334		
2	73632	7494	103400		
3	99032	5673	~~123399~~ 123399		
4	51034	3997	99880		
5	—	—	—		
6	107369	9643	216332		
7	71293	8537	115136		
8	72804	6521	109713		
9	46751	4257	102334		
10	—	—	—		
11					
12					

Final Day 2 Initial Day 3

INK METER READING

DATE 4/12/79 TIME 1:30 RUN NO Day 2 of 3

PRESS NO. 1 RECOVERY METER 1643.6 DECANTER 24941

Day 2

FOUNTAIN	INK.	VARNISH	SOLVENT	INK USED	VARNISH USED	SOLVENT USED
1	110652	11515	109411	48	0	77
2	73667	7497 ~~7507~~	103437	35	3	37
3	99060	5673	123443	28	0	44
4	51056	3997	99904	18	0	24
5	—	—	—	—	—	—
6	107413	9643	216403	44	0	71
7	71331	8537	115174	38	0	38
8	72852	6523	109744	44	2	31
9	46771	4257	102362	20	0	28
10	—	—	—	—	—	—
11						
12						
					Decanter	881
					Recovery Meter	709.6

Final Day 3

INK METER READING

DATE 4/12/79 TIME 5:50 RUN NO Day 3

PRESS NO. 1 RECOVERY METER 2411.2 DECANTER 25705

Day 3

FOUNTAIN	INK.	VARNISH	SOLVENT	INK USED	VARNISH USED	SOLVENT USED
1	110707	11525	~~123519~~ 109447	~~76~~ 55	0	76
2	73107	7497	103476	~~39~~ 40	0	39
3	99110	5685	123519	~~76~~ 50	12	76
4	51072	3997	99940	~~36~~ 16	0	36
5	—	—	—	—	—	—
6	107464	9643	216482	~~79~~ 51	0	79
7	71374	8544	115221	~~47~~ 43	7	47
8	72896	6530	109782	~~38~~ 44	7	38
9	46792	4257	102394	~~32~~ 21	0	32
10	—	—	—	—	—	—
11						
12						

Decanter 764

Recovery Meter 767.6

APPENDIX E

METER READINGS
PRESS #2

INITIAL
INK METER READING

DATE 4/11/79 TIME 3:00 & 3:10 RUN NO Day 1

PRESS NO. 2 RECOVERY METER 8261.4 DECANTER 20686

FOUNTAIN	INK.	VARNISH	SOLVENT		
1	37314	1430	32428		
2	21712	2355	22149		
3	24836	3662	21117		
4	9815	515	8971		
5	39731	1552	45705		
6	17238	2714	21921		
7	21015	1347	26564		
8	24494	271	27802		
9	46771	1398	56368		
10	24228	2672	41714		
11	24714	1317	28666		
12	23478	212	24648		

Final

INK METER READING

DATE 4/11/74 TIME 7:20 to 7:35 RUN NO Day 1

PRESS NO. 2 RECOVERY METER 8926.3 DECANTER (21545)*

Day 1

FOUNTAIN	INK.	VARNISH	SOLVENT	Ink USED	VARNISH USED	SOLVENT USED
1	37321	1432	32434	7	2	6
2	21726	2355	22166	14	0	17
3	24658	3662	21119	22	0	2
4	9841	515	8990	26	0	19
5	39753	1555	45720	22	3	15
6	17260	2714	21932	22	0	11
7	21115	1348	26580	20	1	16
8	24508	271	27814	14	0	12
9	46804	1404	56395	33	6	27
10	24248 ~~2672~~	2672	41752 ~~24248~~	20	0	38
11	24733	1317	28673	19	0	7
12	23499	212	24664	21	0	16

Decanter 859

Recovery meter 664.9

Initial

INK METER READING

DATE 4/12/79 TIME 8:55 to 9:10 RUN NO Day 2

PRESS NO. 2 RECOVERY METER 0934 DECANTER 24060

FOUNTAIN	INK.	VARNISH	SOLVENT		
1	37423	1441	32519		
2	21799	2363	22228		
3	24943	3669	21186		
4	9854	~~9854~~ 515	9004		
5	39865	1559	45802		
6	17314	2719	21996		
7	21202	1348	26663		
8	24557	271	27916		
9	46970	1409	56553		
10	24337	2677	~~24337~~ 41959		
11	24812	1317	28752		
12	23564	212	24748		

Final 2 Init. 3

INK METER READING

DATE 4/12/79 TIME 1:35 RUN NO Day 2-3

PRESS NO. 2 RECOVERY METER ~~28~~ 1043.6 DECANTER 24941

Day 2

FOUNTAIN	INK.	VARNISH	SOLVENT	INK USED	VARNISH USED	SOLVENT USED
1	37449 ~~1441~~	1441 ~~37449~~	32541	26	0	23
2	21817	2363	22239	14	0	11
3	24969 ~~3669~~	3669 ~~24969~~	21203	26	0	17
4	9862	515	9013	9	0	9
5	39897	1560	45826	32	1	24
6	17339	2719	22018	25	0	22
7	21231	1352	26691	29	4	28
8	24577	271	27942	20	0	26
9	47012	1418	56595	42	9	42
10	24363	2660	41891 ~~24363~~	26	3	32
11	24836	1319	28774	24	2	22
12	23588 ~~212~~	212 ~~23588~~	24771	24	0	23

Decanter 881

Solvent Meter 709.6

Final day 3

INK METER READING

DATE 4/12/79 TIME 5:55 RUN NO Day 3

PRESS NO. 2 RECOVERY METER 2411.2 DECANTER 25705

FOUNTAIN	INK.	VARNISH	SOLVENT	INK USED	VARNISH USED	SOLVENT USED
1	37467	1448	32561	18	7	20
2	21826	2366	22252	9	3	13
3	24987	3669 ~~24967~~	21218	18	0	10
4	9874	520	9022	12	5	9
5	39924	1569	45848	27	9	22
6	17353	2724	22038	14	5	20
7	21248	1354	26718	17	2	27
8	24591	273	27970	14	2	28
9	47061	1433	56648	49	15	53
10	24388	2691	41906	25	11	15
11	24854	1324	28795	18	5	21
12	23610	214	24795	22	2	24

Decantor 764

Solvent Meter 767.6

APPENDIX F

PRESS RUN DATA

TABLE F1. TEXAS COLOR - TEST SUMMARY

Run	Date	Time	Operation	
Day 1	4/11/79	14:45 - 19:15	Press #1 : 8-units	77 7/8" web
			Press #2 : 8-units	93" web
			Press #2 4-units	93" web
Day 2	4/12/79	08:50 - 13:20	Press #1 : 8-units	62 1/2" web
			Press #2 : 8-units	93" web
			Press #2 : 4-units	93" web
Day 3	4/12/79	13:20 - 17:50	Press #1 : 8-units	62 1/2" web
			Press #2 : 8-units	93" web
			Press #2 : 4-units	93" web

TABLE F-2 TEXAS COLOR OPERATING DATA - RUN #1 on 4/11/79

Time	Press Tachometer Readings #1 (8)	#2 (8)	#2 (4)	Adsorber Cycle	Recovery Meter, gal	Decantor, gal.
14:45	80	54	0	AAS	8261.4	20686
14:59	80	0	0			
15:00	80	0	0			
15:15	80	0	0			
15:30	40	0	0	AAD		
15:45	80	0	0	AAI		
16:00	80	0	0			
16:04	0	0	0			
16:15	0	0	0	ASA		
16:30	40	0	0			
1632	78	0	0			
16:38	0	0	0			
16:40	78	4	0			
16:42	78	14	0			
16:45	78	50	0			
17:00	78	50	0	ADA	(664.9)	(859)
17:15	78	50	0	AIA		
17:30	78	50	0			
17:43	78	54	0			
17:45	78	54	0	SAA		
17:48	0	54	0			
18:00	0	54	0			
18:15	0	54	0			
18:23	78	54	0			
18:30	78	54	0	DAA		
18:45	78	54	80	IAA		
18:57	78	0	80			
19:00	78	0	80			
19:15	78	0	80		8926.3	21545

TABLE F-3. TEXAS COLOR OPERATING DATA - RUN #2 ON 4/12/79

Time	Press #1 (B)	Tachometer Readings #2 (B)	#2 (Y)	Absorber Cycle	Recovery Meter, gal	Decanter, gal
08:50	80	56	84	AAS	934.0	24060
09:04	0	56	84	↓		
09:05	0	56	84	↓		
09:13	80	56	84	↓		
09:20	80	56	84	↓		
09:35	80	56	84	ARD		
09:50	80	56	84	ARI		
10:05	80	56	84	↓		
10:20	80	56	84	ASA		
10:35	80	56	84	↓	↑	
10:50	80	56	84	↓		↑
11:05	80	56	84	ADA		
11:16	80	0	84	↓		
11:20	90	0	84	AIA	(709.6)	(188)
11:26	0	0	84	↓		
11:35	0	0	84	↓		
11:38	0	56	84	↓		
11:50	0	55	84	SAA	↓	↓
11:58	4	55	0	↓		
12:05	0	55	0	↓		
12:20	4	54	0	↓		
12:33	72	54	0	↓		
12:35	72	54	0	DAA		
12:38	72	0	0	↓		
12:50	72	0	0	IAA		
13:02	80	0	0	↓		
13:05	80	0	0	↓		
13:20	80	0	0	↓	1643.6	24941

TABLE F-4 TEXAS COLOR OPERATING DATA - RUN #3 ON 4/12/79

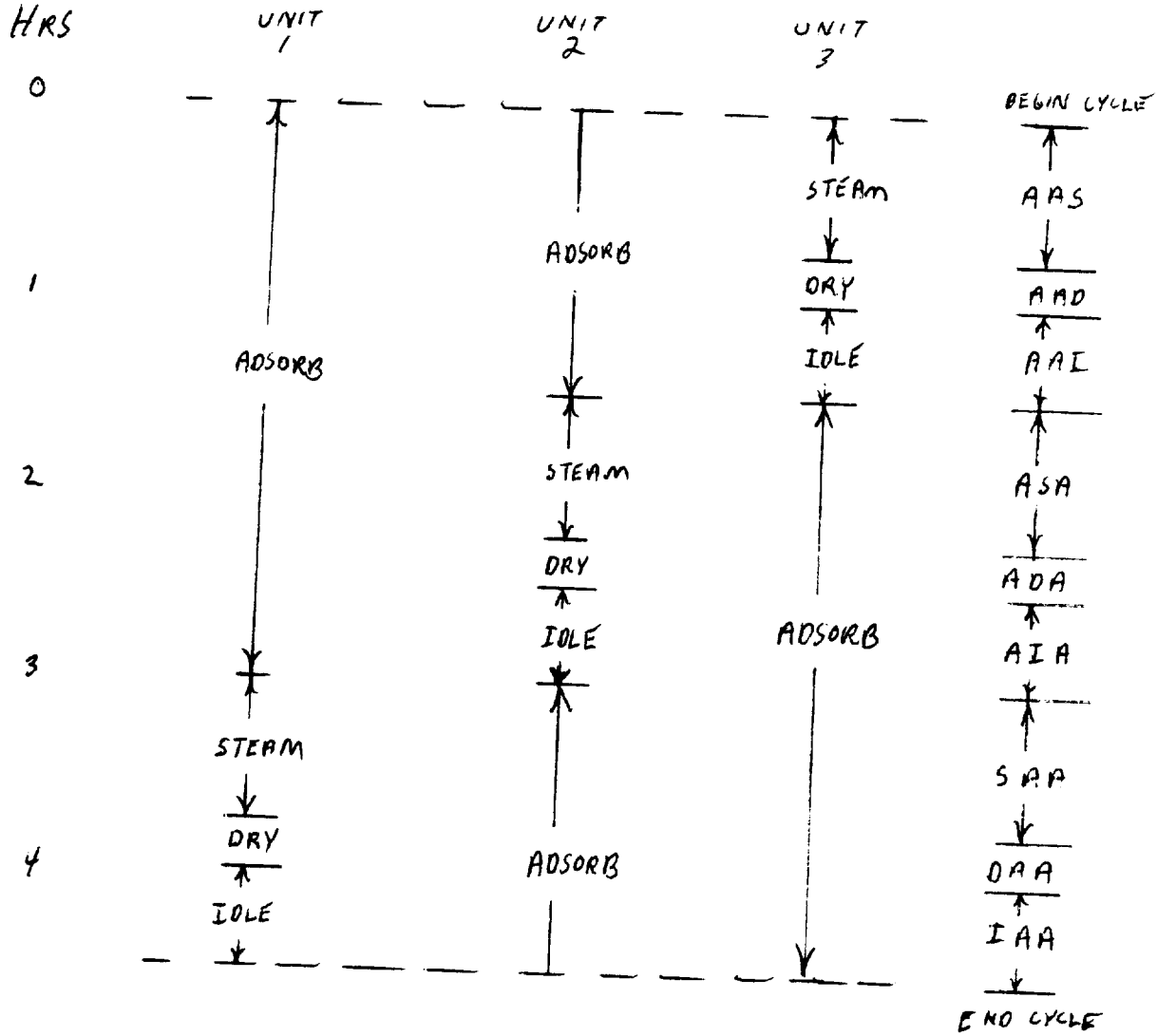
Time	Press #1 (B)	Tachometer #2 (S)	Readings #2 (Y)	Adsorber Cycle	Recovery Meter, gal	Decanter, gal
13:20	80	0	0	AAS	1643.6	24941
13:26	0	0	0	↓		
13:35	0	0	0	↓		
13:50	4	0	0	↓		
13:53	78	0	0	↓		
13:56	78	55	0	↓		
14:05	78	55	0	AAD		
14:20	78	54	0	AAI		
14:35	78	54	0	↓		
14:50	78	54	0	ASA	↑	
15:05	78	52	0	↓		
15:12	0	52	0	↓		
15:20	0	52	0	↓	(767.6)	* (796)
15:35	0	52	0	ADA		
15:42	78	52	0	↓		
15:45	78	52	75	↓		
15:50	78	52	76	AIA		
16:05	78	52	0	↓		
16:13	78	52	87	↓		
16:20	78	52	87	SAA		
16:35	78	52	88	↓		
16:50	78	52	89	↓		
17:05	78	52	90	DAA		
17:20	78	52	90	IAA		
17:35	78	52	90	↓		
17:50	78	52	91		2411.2	25705 *

* Readings stopped. Next readings at 18:35 show ~ 220 gal Decanter liquid than expected. Therefore, Run 3 Decanter liquid total may be ~ 880 gal and not 764.

TABLE F-5 TEXAS COLOR - INK, VARNISH, SOLVENT USED

	INK gal	VARNISH gal	SOLVENT gal
Press #1:			
Day 1 -	318	18	367
Day 2 -	275	5	350
Day 3 -	320	26	423
Press #2:			
Day 1 -	240	12	186
Day 2 -	300	19	279
Day 3 -	243	66	262
Total #1 & #2:			
Day 1 -	558	30	553
Day 2 -	575	24	629
Day 3 -	563	92	685

TEXAS COLOR ADSORBER CYCLE



APPENDIX G

INLET DATA - GC/FID

TEXAS COLOR - INLET

Sample Time	Range	Attenuation	Tot. Hydroc. Pk. Ht.	Toluene Pk. Ht.	Naptha Pk. Hts 1	2	3	Xylene Pk. Hts 1	2	Tot. Hydroc. of methane ppm	Tot. Hydroc. of ethane ppm	Toluene ppm	Naptha ppm	Xylene ppm	Adsorber Cycle
4/11/79															
103 ppm Tol.	1	64		79											
				79											
				80											
				82											
				88											
				88											
505 ppm Tol.	10^2	8		42											
				42											
				44											
1030 ppm Tol.	10^2	16		53											
				39											
				40											
				40											
14:17	10^2	4		59	40	30	10	1	3			369	506.8	26.5	(AIA)
14:24				57	40	28	10	1	3			356	444	26.5	
14:45				55	38	27	10					343	475		
14:49				55	37	27	10					343	469		
14:52				55	38	27	10					343	475		
14:56				55	37	27	10	1	3			343	469		
15:01				56	38	29	10					350	482		"Dry"
15:05				42	30	19	7	1	3			349	349		AAS
15:10				39	28	16	6					240	317		
15:20				47	34	19	7					291	380		
15:24				37	27	16	6					227	311		
15:27				48	37	20	7					298	406		
15:30				38	28	16	6					233	317		
15:33				38	28	16	6					233	317		
15:37				41	31	19	7					253	355		
1025 ppm C_2H_5	10^2	16	41												
			51												
			50												
			51												
			51												
16:00	10^2	32	59							5249					AAD
			59							5249					
			57							5071					
			56							4982					
10,500 ppm CH_4	10^2	128	39												
			39												
			40												
			40												
			40												
16:13	10^2	16	13							578					AAI
16:15	10^2	4	40							445					
			41							456					
			45							500					
16:26	1	32		44	38	20	7					10	34		
16:30				51	43	23	8					13	39		
16:45	10^2	4		45	34	22	9					279	412		SAA
16:48				56	39	29	11					350	488		
16:51				55	36	29	10					343	469		
16:55				55	39	29	10					343	488		
505 ppm Tol.	10^2	8		41											
				41											
17:10	10^2	8		31	21	16	7					389	557		
17:15				29	20	15	6					363	519		
17:20	10^2	32	84							7473					DAA
			82							7295					
			90							8006					
			91							8095					
17:25	10^2	64	41							7295					
			44							7828					
			45							8006					
			43							7651					
17:30	10^2	8		32	21	16	6					402	545		
17:35				37	25	19	6	0	2			466	633		IAA
17:40				37	25	18	7	1	2			466	633		
17:45				33	23	17	7	1	3			415	595		
17:50				36	25	19	7					453	645		

TEXAS COLOR- INLET

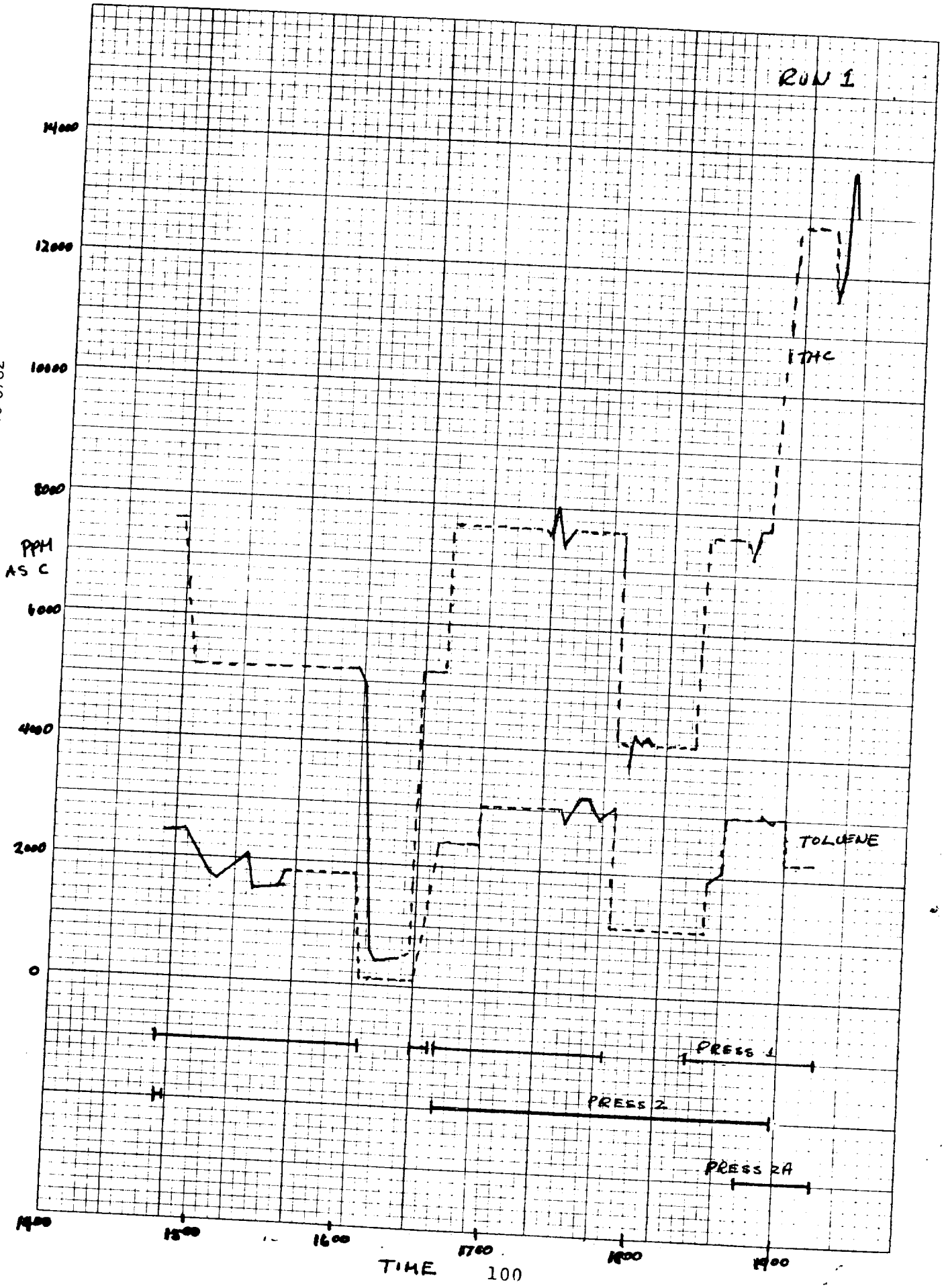
Sample & Time	Range	Attenuation	Tot. Hydrocarbon Pk. Ht.	Toluene Pk. Ht.	Naptha Pk. Ht. 1	Naptha Pk. Ht. 2	Naptha Pk. Ht. 3	Xylene Pk. Ht. 1	Xylene Pk. Ht. 2	Tot. Hydroc. as Methane ppm	Tot. Hydroc. as Ethane ppm	Toluene ppm	Naptha ppm	Xylene ppm	Adsorber Cycle
17:55	10^2	64	21							3736					I AA
↓	↓	↓	21							3736					↓
			24							4270					
18:00	10^2	64	23							4092					
↓	↓	↓	24							4270					
18:03	10^2	8		14	9	9	3					168	266		
18:28	↓	↓		22	16	10	5	0	1			272	393		ASA
18:38	10^2	4		47	32	22	9					291	399		
18:44	10^2	32	81							7206					
↓	↓	↓	87							7740					↓
			87							7740					
18:50	10^2	4		69	47	35	14					434	608		ADA
18:53				68	45	36	15	1	4			428	608	24	↓
19:00				52	37	29	11					324	456		AIA
19:05				52	37	25	10					324	456		
19:10	↓	↓		52	36	29	10					324	444		
19:15	10^2	64	65							11565					↓
↓	↓	↓	68							12100					
			77							13700					
			73							12990					
103 ppm Tol.	1	64		65											T
↓	↓	↓		68											S
				63											T
505 ppm Tol.	10^2	4		86											A
↓	↓	↓		82											N
				83											D
				85											A
															R
															D
															S
															"Dry 2" END
4/14/79															"Dry 2"
08:55	10^2	4		54	38	27	15					375	549		AAS
09:00	↓	↓		59	42	30	16					410	605		↓
09:05	↓	↓		48	32	25	13					332	479		
09:10	10^2	32	41							3770					
09:13	↓	↓	41							3770					
↓			38							3496					
09:24	10^2	8		34	22	18	9	0	1			474	675		↓
505 ppm Tol.	10^2	8		41											S
				37											T
	↓	↓		38											A
1030 ppm Tol.	10^2	32		18											N
	10^2	16		36											D
↓	↓	↓		35											A
				35											R
															D
															S
09:47	10^2	64	39							7147					AAD
↓	↓	↓	40							7330					↓
			41							7512					
09:51	10^2	4		64	44	35	15					446	646		
09:55	↓	↓		71	48	39	16	1	3			495	710	16.5	AAI
10:00				71	48	39	17					495	717		
10:05	10^2	64	52							9520					↓
↓	↓	↓	56							10250					
			55							10068					
10,500 ppm CH_4	10^2	64	24												S
	10^2	256	18												T
	10^2	128	36												A
↓	↓	↓	36												N
			36												D
1025 ppm C_2H_6	10^2	4	14												A
↓	↓	↓	16												R
			17												D
															S
10:45	10^2	4		73	47	40	14					510	696		SAA
10:50				66	45	37	14					460	661		
10:55				71	45	40	15	1	4			495	689		
11:00	↓	↓		67	44	37	14					467	654		
11:05	10^2	64	45							8242					
			44							8060					
↓	↓	↓	43							7877					
			43							7877					
11:15	10^2	4		69	47	39	14	1	3			451	689	16.5	↓
11:20	↓	↓		51	35	25	10					353	479		DAA
															↓

TEXAS COLOR- INLET

Sample & Time	Range	Attenuation	Tot. Hydroc. Pk. Ht.	Toluene Pk. Ht.	Naptha Pk. Ht. 1	Naptha Pk. Ht. 2	Naptha Pk. Ht. 3	Xylene Pk. Ht. 1	Xylene Pk. Ht. 2	Tot. Hydroc. as methane ppm	Tot. Hydroc. as Ethane ppm	Toluene ppm	Naptha ppm	Xylene ppm	Adsorber Cycle
11:25	10^2	64	34							6234					DAA
↓	↓	↓	33							6052					↓
			20							3679					IAA
			12							2218					
11:30	10^2	4		17	11	10	3					112	157		↓
11:35	↓	↓		13	7	8	2					83	106		
505 ppm Tol.	10^2	8		38											STANDARDS
↓	↓	↓		39											
				39											
103 ppm Tol.	1	64		69											
↓	↓	↓		71											
				77											
				73											
12:00	10^2	4		24	13	15	5					162	220		ASA
12:05	↓	↓		26	15	17	5					176	148		
12:10	10^2	32	32							2948					↓
↓	↓	↓	31							2857					
			30							2766					
12:15	10^2	4		23	18	19	4					154	276		
12:20	↓	↓		26	16	17	5					176	255		
12:25	10^2	32	34	27	16	17	5					183	255		
12:30	↓	↓	65							3131					
↓			69							5960					
			67							6326					
										6143					
12:35	10^2	4		58	39	31	11					403	556		↓
12:40	↓	↓		32	23	15	4					218	283		
12:45				38	27	17	5					261	332		ADA
12:50				40	29	17	7	0	2			275	353	2.5	↓
13:00				35	25	16	5					240	311		
13:05	10^2	32	50							4591					AIA
↓	↓	↓	50							4591					↓
			51							4683					
13:10	10^2	4		47	35	21	8					325	437		
13:15	↓	↓		45	33	21	7					311	416		
13:20				45	32	20	7					311	402		
13:25				45	32	21	7					311	409		
13:30	10^2	32	9												$\frac{gm}{cm^3}$
↓	↓	↓	8							849					AAS
	10^2	16	20							758					↓
	↓	↓	16							940					
1025 ppm C_2H_6	10^2	16	43							758					
↓	↓	↓	42												STANDARDS
			44												
			42												
108 ppm C_2H_6	10^2	2	33												
↓	↓	↓	33												
			33												
13:40	10^2	4		2	3	2						5.2	23		
13:50	1	32		54	42	27	9	1	3			21.7	32	16	AAS
14:10	10^2	4		71	47	37	13			6234		495	668		↓
14:18	10^2	32	66												AAD
14:24	10^2	4		62	43	33	11	0	2			431	548	2.5	↓
14:30	↓	↓		70	46	37	13					488	661		AAI
14:35				70	49	36	13	1	3			488	668	16	↓
14:47	10^2	32	78							7147					
14:58	10^2	4		72	48	39	14	1	3			502	696	16	
15:03	↓	↓		69	45	37	13	1	3			481	654	16	SAA
15:10				70	45	36	13					488	647		
15:16	10^2	32	34							3131					↓
15:18	↓	↓	31							2857					
15:20	10^2	4		31	18	19	6	1	2			211	290	9.5	
505 ppm Tol.	10^2	8		40								559			- -
↓	↓	↓		42								588			
				41								573			Sv.
15:35	10^2	4		25	15	15	5	0	2			169	234	2.5	- -
15:40	↓	↓		27	15	16	5					163	241		↓
15:47	10^2	32	83							7603					OAA
↓	↓	↓	70							6417					↓
			81							7421					
			81							7421					

TEXAS COLOR- INLET

Sample & Time	Range	Attenuation	Tot. Hydrocarbon Pk. Ht.	Toluene Pk. Ht.	Naptha Pk. Ht. 1	2	3	Xylene Pk. Ht. 1	2	Tot. Hydrocarbon as methane ppm	Tot. Hydrocarbon as Cetane ppm	Toluene ppm	Naptha ppm 1	2	3	Xylene ppm 1	2	Adsorber Cycle
15:50	10^2	4		67	43	37	13					467		640				DAA
15:55	↓	↓		71	47	40	19	1	4			495		731		23		↓
16:00				75	49	38	13					524		689				IAA
16:05				70	49	38	13					488		689				
16:10	10^2	32	84							7695								
↓	↓	↓	87							7968								
			89							8151								
			95							8699								
16:15	10^2	4		82	54	45	16	2	4			573		794		30		
16:20	↓	↓		68	44	37	13	1	3			474		647		16		↓
16:25				70	46	38	14	2	4			488		675		30		
16:30				79	52	43	15	2	5			552		759		37		ASA
16:37				67	44	37	14					481		654				
16:40	10^2	64	47							8607								
↓	↓	↓	48							8790								
			48							8790								
16:45	10^2	4		80	51	40	20	4	6			560		766		59		
16:50	↓	↓		79	52	44	15	2	5			552		766		37		
16:55				79	53	44	15					552		773				
17:00	10^2	64	47							8607								
↓	↓	↓	47							8607								
			48							8790								
17:05	10^2	4		80	53	45	16					559		787				
17:10	↓	↓		70	46	39	13	2	5			488		675		37		↓
17:15				64	44	36	13					446		640				ADA
17:20	10^2	64	43							7877								
↓	↓	↓	42							7695								
			43							7877								
17:25	10^2	4		73	51	42	14	2	5			510		738		37		↓
17:30	↓	↓		81	54	46	16	2	6			566		801		44		AIA
17:35				82	55	46	17	2	6			573		815		44		
17:40	10^2	64	49							8972								
↓	↓	↓	49							8972								
			50							9155								
17:45	10^2	4		82	54	46	17	2	6			573		808		44		
17:50	↓	↓		82	55	46	17					573		815				
17:54	10^2	64	46							8425								
↓	↓	↓	49							8972								End Run
1025 ppm C_2H_6	10^2	16	46															↑
↓	↓	↓	46															S
			46															T
10,500 ppm CH_4	10^2	64	71															A
↓	↓	↓	71															N
			71															D
103 ppm Tol.	1	128	83															B
↓	↓	↓	82															Y
			82															P
109 ppm C_2H_6	1	128	57															A
↓	↓	↓	59															S
			59															
103 ppm Tol.	1	64		64														
↓	↓	↓		65														
				60														
				64														
505 ppm Tol.	10^2	8		40														
↓	↓	↓		41														
				41														
1030 ppm Tol.	10^2	16		35														
↓	↓	↓		36														
				36														



46 0782

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

Inlet Run 1

Factor 0.489 mg/m³ ~ 1 ppm
60,600 scfm = 1716 m³/min

TIME	MIN	TOTAL HC (as C) ppm	mg/m³	Kg	Toluene (as C) ppm	mg/m³	Kg	Naphtha (as C) ppm	mg/m³	Kg
1445-1459	14	7600	3792	91.1	2400	1198	28.8	3776	1884	45.3
1459-1604	65	5200	2595	289.4	1820	908	101.3	2874	1434	159.9
1604-1630	26	500	250	11.2	80	39.9	1.8	290	145	6.5
1630-1638	8	5200	2595	35.6	2420	1208	16.6	2874	1434	19.7
1638-1640	2	500	250	0.9	80	39.9	0.1	290	145	0.5
1640-1748	68	7600	3792	442.5	3030	1512	176.4	4271	2131	248.7
1748-1823	35	4100	2046	122.9	1180	589	35.4	2128	1062	63.8
1823-1845	22	7600	3792	143.2	3000	1497	56.5	3168	1581	59.7
1845-1857	12	7200	3842	79.1	3000	1497	30.8	4864	2427	50.0
1857-1915	18	12280	6377	197.0	2250	1123	34.7	3616	1804	55.7
	270			1412.9			482.4			709.8
		Wgt Avg = 6111	Wgt Avg = 3049		Wgt Avg = 2086	Wgt Avg = 1041		Wgt Avg = 3070	Wgt Avg = 1532	

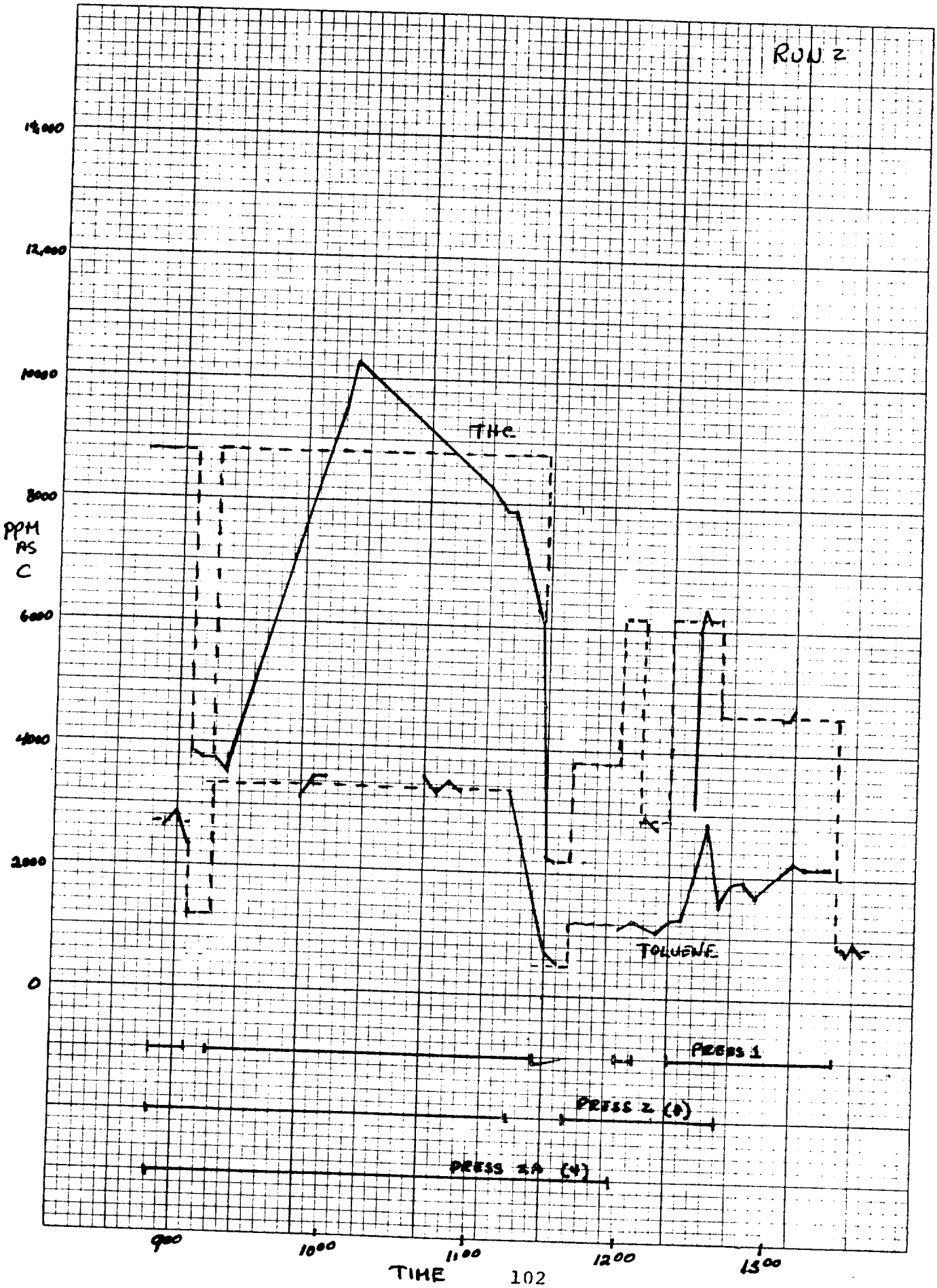
$482.4 \times \frac{92.13}{84} = 529.0$ kg Tol.

$\frac{529.0 \text{ kg Tol}}{.866 \text{ kg/l}} \times \frac{.2642 \text{ gal}}{\text{l}} = 161.4$ gal T

$709.8 \times \frac{115.92}{96} = 857.1$ kg Nap.

$\frac{857.1}{.742} \times .2642 = 305.2$

Tol Solvent $161.4 + 305.2 = 466.6$ gal.



K•E 10 X 10 TO THE INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0782

INLET RUN 2

FACTOR - 0.499 mg/m³ ~ 1 ppm
61,700 acfm × .02832 = 1747.3 m³/min

TIME	MIN	TOTAL HC ppm	TOTAL HC mg/m³	TOTAL HC Kg	TOLUENE (60%) ppm	TOLUENE (60%) mg/m³	TOLUENE (60%) Kg	NAPHTHA ppm	NAPHTHA mg/m³	NAPHTHA Kg
850-904	14	8975	4479	109.6	2700	1347	33.0	4614	2303	55.3
904-913	9	3800	1896	29.8	1200	599	9.4	3832	1912	29.5
913-920	7	3600	1796	22.0	3350	1672	20.5	5448	2719	32.7
920-930	10	4200	2096	36.6	"	"	29.2	"	"	46.7
930-940	10	5500	2745	48.0	"	"	29.2	"	"	46.7
940-950	10	6900	3443	60.2	"	"	29.2	"	"	46.7
950-1000	10	8175	4079	71.3	"	"	29.2	"	"	46.7
1000-1010	10	9500	4741	82.8	"	"	29.2	"	"	46.7
1010-1020	10	10050	5015	89.2	"	"	29.2	"	"	46.7
1020-1040	20	9600	4790	167.4	"	"	58.4	"	"	93.3
1040-1050	10	9000	4491	78.5	"	"	29.2	"	"	46.7
1050-1100	10	8600	4291	75.0	"	"	29.2	"	"	46.7
1100-1110	10	8250	4117	71.9	"	"	29.2	"	"	46.7
1110-1120	10	7600	3792	66.3	2950	1472	25.7	4672	2331	40.0
1120-1130	10	6600	3292	57.5	1600	798	13.9	1256	628	10.8
1130-1138	8	2200	1098	15.3	500	249	3.5	864	431	5.9
1138-1158	20	3800	1896	66.3	1200	599	20.9	1798	897	30.8
1158-1205	7	6200	3094	37.8	1200	599	7.3	"	"	10.8
1205-1220	15	2900	1447	37.9	1200	599	15.7	"	"	23.1
1220-1238	18	6200	3094	97.3	2000	998	31.4	2973	1484	45.8
1238-1320	42	4600	2295	168.4	2000	998	73.2	"	"	107.0
		Wgt Avg 6440.8	Wgt Avg 3214.0	1489.1	Wgt Avg 2490.1	Wgt Avg 1242.6	575.7	Wgt Avg 3914	Wgt Avg = 1953	904.9

$575.7 \times \frac{92.13}{84} = 631.4$ kg Tol

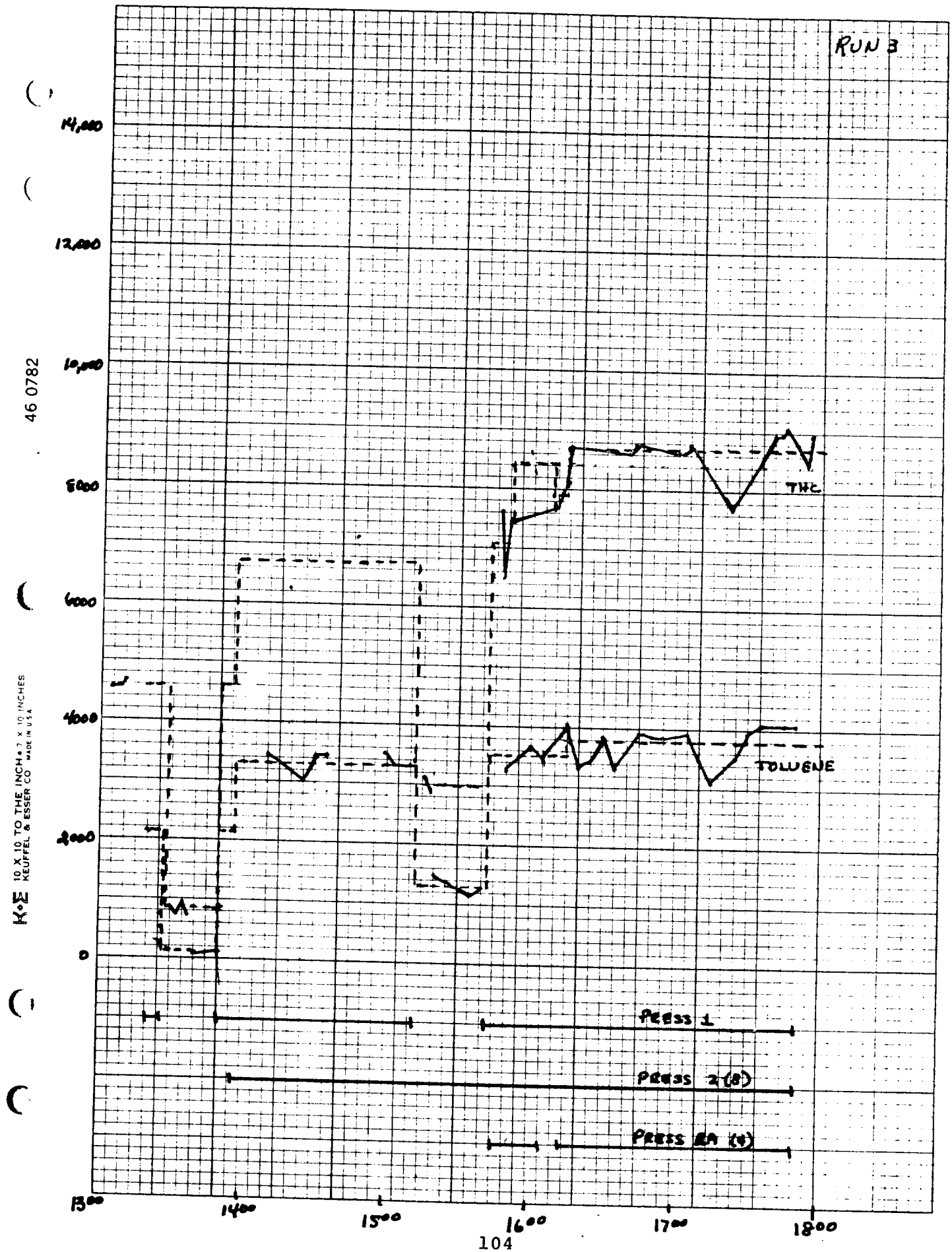
$631.4 \times \frac{.2642}{.866} = 192.6$ gal T.

$904.9 \times \frac{115.92}{96} = 1092.7$ kg Nap.

$\frac{1092.7 \times .2642}{.742} = 389.1$ gal N

ppm × .499 = mg/m³

$\frac{mg/m^3 \times 1747.3\ m^3/min \times min}{1 \times 10^6} = Kg$


RUN 3
14,000
12,000
10,000
8000
6000
4000
2000
0
THC
TOLUENE
PRESS 1
PRESS 2 (8)
PRESS 2A (4)
1300
1400
1500
1600
1700
1800
46 0782
K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

Inlet Run 3

Factor 0.499 mg/m³ ~ 1 ppm
61,400 × .02832 = 1738.8 m³/min

TIME	MIN	Total HC ppm	Total HC mg/m³	Total HC Kg	Toluene ppm	Toluene mg/m³	Toluene Kg	Naphtha ppm	Naphtha mg/m³	Naphtha Kg
1320-1326	6	4600	2295	23.9	2150	1072.9	11.2	3244	1619	16.9
1326-1350	24	850	424	17.7	100	49.9	2.1	220	109.8	4.6
1350-1356	6	4600	2295	23.9	2150	1073	11.2	3240	1617	16.9
1356-1512	76	6700	3343	441.8	3300	1647	217.6	5248	2619	346.1
1512-1542	30	3000	1497	78.1	1300	649	33.9	2040	1018	53.1
1542-1545	3	7100	3542	18.5	3500	1747	9.1	5498	2744	14.3
1545-1605	20	8700	4341	151.0	3500	1747	60.8	5498	2744	95.4
1605-1613	8	7900	3942	54.9	3500	1747	24.3	5498	2744	38.2
1613-1750	97	8700	4341	732.2	3800	1896	319.8	5956	2972	501.3
		Wgt Avg 6582	Wgt Avg 3284	1541.9	Wgt Avg 2945	Wgt Avg 1470	689.9	Wgt Avg 4639	Wgt Avg 2315	1086.7

$$689.9 \times \frac{92.13}{84} = 756.7 \text{ kg Tol}$$

$$756.7 \times \frac{.2642}{.866} = 230.9 \text{ gal}$$

$$1086.7 \times \frac{115.92}{96} = 1312.2 \text{ kg N}$$

$$1312.2 \times \frac{.2642}{.742} = 467.2 \text{ gal}$$

APPENDIX H

OUTLET DATA - GC/FID

TEXAS COLOR

Outlet Stack

Sample & Time	Range	Attenuation	Naptha 1 Pk. Ht.	Naphtha 2 Pk. Ht.	Naptha 3 Pk. Ht.	Toluene Pk. Ht.	Total Hydroc. Pk. Ht.	Naptha 1 ppm	Naptha 2 ppm	Naptha 3 ppm	Toluene ppm	Total Hydroc. ppm	Adsorber Cycle
9/14 11 103 ppm CH	1	64				99							
↓	↓	↓				101							
						101							
8 ppm Tol	1	8				19							
↓	1	4				38							
672 Mu:4	1	4				210					18.5		
↓	↓	↓				210					18.5		
14:40	1	8	241	227	18	119			64.6		20 19.8		(A IA)
14:45	1	8	88	82	15	56			27.8		12.1		OR 1 AAS
10.3 ppm CH	1	16					20						↑
↓	↓	↓					20						
							19						
108 ppm C_2H_6	1	32					236						S
	↓	↓					235						T
	1	128					61						A
							56						N
	↓	↓					61						D
	1	256					60						A
							35						R
	↓	↓					36						D
							29						S
							28						
1025 ppm C_2H_6	1	512					156						
	↓	↓					156						↓
15:16	1	16					47					26.8	AAS
15:17							52					29.9	
15:18							52					29.9	
15:19							60					33.2	
15:20	↓	↓					48					26.3	↓
15:26	1	4	78	58	13	47			14.4		8.2		
15:33	1	4	106	92	21	96			18.6		11.2		AAD
15:39	1	4	109	108	26	98			20.1		11.3		↓
15:44	1	4	112	106	25	92			20.1		10.9		AAI
15:50	1	4	162	142	24	113			25.3		12.2		
15:56	1	32					127					112.5	
15:57	↓	↓					124					110	
15:58							133					117	
16:00	1	4	219	192	22	143			31.7		14.0		↓
16:06	1	4	OFF SCALE	OFF SCALE	25	189			—		16.8		
16:15	1	8	141	129	13	100			39.8		17.5		ASA
16:21	1	8	78	72	10	61			24.8		12.7		
16:26	1	8	51	47	7	43			18.1		10.6		
16:31	1	4	53	49	12	52			12.2		8.5		
16:36	1	4	36	34	12	40			10.3		7.8		
16:40	1	16					78					40.5	
16:41							72					38.1	
16:42							72					38.1	
16:43	↓	↓					68					36.4	↓
10.3 ppm CH	1	16					20						↑
↓	1	8					40						std.
	1	8					40						↓
SW VENT:													
1530-1	1	256					140					1154	↑
1530-2	↓	↓					142					1170	SW.
1530-3							146					1203	↓
INLET:													
1545-1	1	1024					136					4483	↑
1545-2	↓	↓					125					4120	Inlet
1545-3							117					3856	↓

108

TEXAS COLOR

OUTLET STACK

Sample & Time	Range	Attenuation	Naptha 1 Pk. Ht.	Naptha 2 Pk. Ht.	Naptha 3 Pk. Ht.	Toluene Pk. Ht.	Total Hydroc. Pk. Ht.	Naptha 1 PPM	Naptha 2 PPM	Naptha 3 PPM	Toluene PPM	Total Hydroc. PPM	Adsorber & Cycle
10,500 ppm CH_4	10^2	32					140						
↓	↓	↓					136						
							125						
							140						
							141						
17:16	1	16											
17:17	↓	↓					51					29.5	AIA
17:18							61					33.6	
17:19							48					28.3	
17:23	1	4	16	24	4	30	51					29.5	
17:27	↓	↓	46	34	11	41			8.0		6.0 7.1		↓
17:31			65	47	15	52			10.8		8.0 7.8		
17:36			76	56	19	58			13.0		8.5		
17:41			90	66	18	66			14.4		7.0 8.8		
									15.9		9.5 9.3		
8 ppm Tol	1	4				45					(81)		
↓	1	4				45							
	1	8				22							
17:54	1	4	12	10	0	17							
18:00	1	2	49	41	21	60			6.7		2.5 6.4		SAA
18:06	1	2	55	49	30	77			8.7		6.0 7.1		
18:12	1	2	56	40	31	95			9.4		8.0 7.7		
18:17	1	2	59	53	35	95			9.2		8.5 8.2		
18:24	1	2	58	52	34	101			9.8		8.5 8.2		
18:30	1	2	53	49	28	117			9.7		8.5 8.4		
18:36	1	2	61	53	40	122			9.3		7.0 8.8		
18:41	1	2	62	61	44	122			10.0		9.0 9.0		stream
18:46	1	2	70	60	44	131			10.4		9.5 9.0		DAA
18:51	1	2	79	67	43	120			10.6		12.0 9.3		↓
18:58	1	2	85	71	42	118			11.0		9.5 9.0		IAA
19:04	1	2	95	78	40	119			11.3		9.5 8.9		
19:10	1	2	117	93	40	120			11.8		9.5 8.9		
19:16	1	2	138	107	41	121			12.9		9.0 9.0		↓
									14.0		9.5 9.0		END DAY 2
8.0 ppm Tol	1	4				51							
↓	↓	↓				46					8.0		
						46					8.1		
672 Nu.4.7	1	4				113					8.1		
↓	↓	↓				106					12.0		
						108					12.0		
											12.0		
PCS #22	1	16					42					25.8	
↓	↓	↓					41					25.4	
PCS # 27	1	16					64					34.8	
↓	↓	↓					34					22.5	
PCS # 17	1	16					69					36.8	
↓	↓	↓					17					15.6	
PCS # 4	1	16					12					13.5	
↓	↓	↓					13					13.9	
							16					15.2	
PCS # 27	1	4	60	29	5	36							
↓	1	4	51	25	5	29					7.5		
PCS # 22	1	4	31	22	8	27					6.0		
↓	1	4	28	30	8	23					5.5		
PCS # 17	1	4	21	19	7	7					5.0		
↓	1	4	25	18	5	4					1.5		
PCS # 4	1	4	17	9	3	22					0.5		
↓	1	4	10	6	2	13					5.0		
											2.5		

Ø-2

Out Let Stack

TEXAS COLOR

Ø-3

Sample & Time	Range	Attenuation	Naptha 1 PK HT	Naptha 2 PK HT	Naptha 3 PK HT	Toluene PK HT	Total Hydrocarbon PK HT	Naptha 1 PPm	Naptha 2 PPm	Naptha 3 PPm	Toluene PPm	Total Hydrocarbon PPm	Adsorber cycle
4/12/79													
METHANE 10.3	1	8					88						
	1	8					35						STANDARDS
	1	8					31						
	1	8					34						
	1	32					9						
Toluene 8.0	1	8				18							
	1	4				43							
	1	8				20							
	1	4				51							
Toluene 8.0 8a	1	4				40							
													Ox2
0856	1	4	12	11	12	20			6.8		3.9		AAS
0901	1	4	15	10	5	17			5.8		3.3		
0906	1	2	34	16	6	37			5.4		3.6		
0912	1	2	37	17	8	40			6.0		5.9		
0917	1	2	46	20	7	39			7.1		3.8		
AUDIT 672	1	4				213					18.5		
AUDIT 672	1	4				217					18.5		
AUDIT 672	1	16					32					31.5	
	1	8					71					21.0	STANDARDS
	1	16					36					21.0	
	1	8					91					27.0	
	1	8					78					23.0	
Toluene 8.0	1	256					197					1966	
	1	256					195					1947	
	1	256					199					1885	
	1	256					185					1752	
Ethane 108	1	256					203					1923	
	1	256					206					1951	
	1	256					216					2046	
	1	256					213					2017	
1000	1	128					170					93.1	AAI
1002	1	128					116					66.5	
1010	1	256					207					213.5	
1012	1	256					187					193.8	
1020	1	8		96	4	75			38.8		29.1		
1031	1	16	126	108	5	94			185.4		72.9		ASA
1036	1	16	58	55	3	43			90.0		33.4		
1041	1	8	75	58	4	56			53.1		21.7		
1046	1	8	73	55	5	53			51.6		20.6		
1104	1	8	75	60	4	69			53.9		26.8		
1109	1	8	167	136	7	109			120.2		42.3		Before Steaming
1113	1	8	181	156	7	119			133.4		46.2		After Steaming
1119	1	8	184	158	7	120			135.4		46.5		
1124	1	8	194	169	7	123			143.5		47.7		ADA
1130	1	16			4	81					62.8		AIA
1137	1	8			10	205					79.5		
1147	1	8			9	213					82.6		
1157	1	16	207	174	5	131			299.4		101.6		SAA
1203	1	16	144	122	4	96			209.5		74.5		
1208	1	16	87	72	3	60			125.7		46.5		
1215	1	16	55	45	2	44			79.1		34.1		
1220	1	8	77	63	3	64			55.5		24.8		
1226	1	4	68	56	4	58			24.8		11.2		
1231	1	64					22					14.6	
1232	1	32					75					18.5	
1234	1	32					70					17.9	

Outlet Stack

TEXAS COLOR

Ø-4

Sample & Time	Range	Attenuation	Naptha 1 PK HT	Naptha 2 PK HT	Naptha 3 PK HT	Toluene PK HT	Total Hydrocarbon PK HT	Naptha 1 PPm	Naptha 2 PPm	Naptha 3 PPm	Toluene PPm	Total Hydrocarbon PPm	Adsorber cycle
1236	1	32					65 17					17.5	
1237	1	4	59	39	3	51			14.6		9.9		OAA
1241	1	4	65	42	3	47			21.3		9.1		Before Steaming
1247	1	4	69	49	3	52			23.5		10.1		After Steaming
1253	1	4	71	56	3	51			25.2		9.9		OAA
8 PPm Bag	1	4				33							
	1	4				32							
Audit 672	1	4				213							
	1	4				203							
	1	4				198							
8 PPm Bag	1	4				29							
	1	4				41							
1318	1	4	43	37	1	26			15.7		8.0		
1328	1	4	148	126	4	81			53.9		50		Avg End IAA
1333	1	4	99	81	2	58			35.3		15.7		After Steaming
1338	1	4	35	24	2	23			11.8		11.2		AAS
1344	1	2	44	32	3	43			7.7		11.5		
1349	1	2	43	27	2	40			7.0		4.2		
1356	1	2	33	17	3	34			5.1		3.9		
1402	1	2	32	16	4	35			5.0		3.3		
1407	1	2	32	14	3	35			4.8		3.4		
1412	1	2	33	14	4	37			4.9		3.4		AAD
1416	1	2	102	74	3	151			17.4		3.6		Before Steam
1421	1	2	102	87	10	146			19.3		14.6		After Steam
1426	1	2	75	57	8	75			13.6		14.2		AAD
1434	1	2	78	64	9	91			14.6		7.3		AAI
1440	1	2	83	63	8	66			14.9		8.8		
1449	1	2	102	69	6	61			17.2		6.4		
1448	1	2	139	83	6	68			22.1		5.9		
1454	1	2	141	74	5	73			21.3		6.6		
1459	1	2	125	76	7	79			20.2		7.1		ASA
1503	1	2	98	65	8	72			16.6		7.7		
1508	1	2	82	53	9	69			14.0		7.0		
1513	1	2	78	57	9	63			14.0		6.7		
1520	1	2	72	44	8	58			12.0		6.6		
1525	1	2	70	41	6	51			11.3		5.6		
1531	1	2	72	37	6	50			11.2		4.9		
1537	1	2	74	36	7	54			11.3		4.8		
1546	1	2	82	35	7	74			13.0		5.2		
1552	1	2	86	67	7	83			15.5		7.2		Before Steam
1557	1	2	98	73	7	86			16.8		8.0		After Steam
16 0[illegible]	1	2	128	94	9	109			22.4		8.3		ADA
1618	1	4	158	110	7	99			53.3		10.1		AIA
1623	1	4	0	156	10	143					19.2		
1631	1	4	165	123	8	112			57.4		27.7		
1638	1	4	94	68	7	74			32.8		21.7		
1644	1	4	83	61	7	72			29.3		14.4		SAA
1650	1	4	65	46	7	59			22.9		14.0		
1656	1	4	67	43	7	53			22.7		11.4		
1703	1	4	80	51	7	59			26.8		11.2		
1708	1	4	115	79	8	71			39.2		17.4		
Audit 672	1	4				206					13.8		OAA
8 Ppm Bag	1	4				42							
	1	4				36					8.1		
1727	1	4	72	60	2	38			26.0		7.0		
1737	1	4			5	113					7.4		IAA
1744	1	8			5	143					21.9		
1752	1	16				147					47.7		
											11.4		End (AAS)

TEXAS COLOR - OUTLET STACK

Ø-5

Sample Time	Range	Attenuation	Naptha 1 Pk Ht	Naptha 2 Pk Ht	Naptha 3 Pk Ht	Toluene Pk Ht	Total Hydrocarbon Pk Ht	Naptha 1 ppm	Naptha 2 ppm	Naptha 3 ppm	Toluene ppm	Total Hydrocarbon ppm	adsorber cycle
17:52	1	256					33					41.8	(BAS)
17:53	1	256					37					45.8	
17:54	1	256					37					45.8	
17:55	1	256					42					50.8	
17:56	1	256					44					52.6	
17:57	1	256					32					40.8	
17:58	1	256					121					128.7	
17:59	1	256					82					90.2	
17:59	1	256					44					52.6	
17:59	1	256					89					97.1	
18:00	1	256					76					84.3	
18:00	1	256					108					115.8	
							124					131.6	

RUN 1 OUTLET

TIME	TOL	NAP
1526	8.2	14.4
1533	11.2	18.6
1538	11.3	20.1
1544	10.9	20.1
1550	12.2	25.3
1600	14.0	31.7
1615	17.5	39.8
1621	12.7	24.8
1626	10.6	18.1
1631	8.5	12.2
1636	7.8	10.3
1723	7.1	8.0
1727	7.8	10.8
1731	8.5	13.0
1736	8.8	14.4
1741	9.3	15.9
1754	6.4	6.7
1800	7.1	8.7
1806	7.7	9.4
1812	8.2	9.2
1817	8.2	9.8
1824	8.4	9.7
1830	8.8	9.3
1836	9.0	10.0
1841	9.0	10.4
1846	9.3	10.6
1851	9.0	11.0
1858	8.9	11.3
1904	8.9	11.8
1910	9.0	12.9
1916	9.0	14.0

60,600 acfm × .02832 = 1716 m^3/min

Avg Tol Conc = 9.5
~ 66.5 ppm Carbon

66.5 × .499 = 33.2 mg/m^3

$$\frac{33.2\ mg/m^3 \times 1716\ m^3/min \times 270}{1 \times 10^6} = 15.4\ kg\ Tol\ (Carbon)$$

$$15.4\ kg\ Tol\ (Carbon) \times \frac{92.13}{84} = 16.9\ kg\ Tol.$$

$$16.9 \times \frac{.2642}{.866} = 5.15\ gal\ Tol.$$

Avg Naphtha Conc = 14.5 ppm
~ 116 ppm CH_4 eq.

116 × .499 = 57.9 mg/m^3

$$\frac{57.9 \times 1716 \times 270}{1 \times 10^6} = 26.8\ kg.\ Nap.\ as\ carbon$$

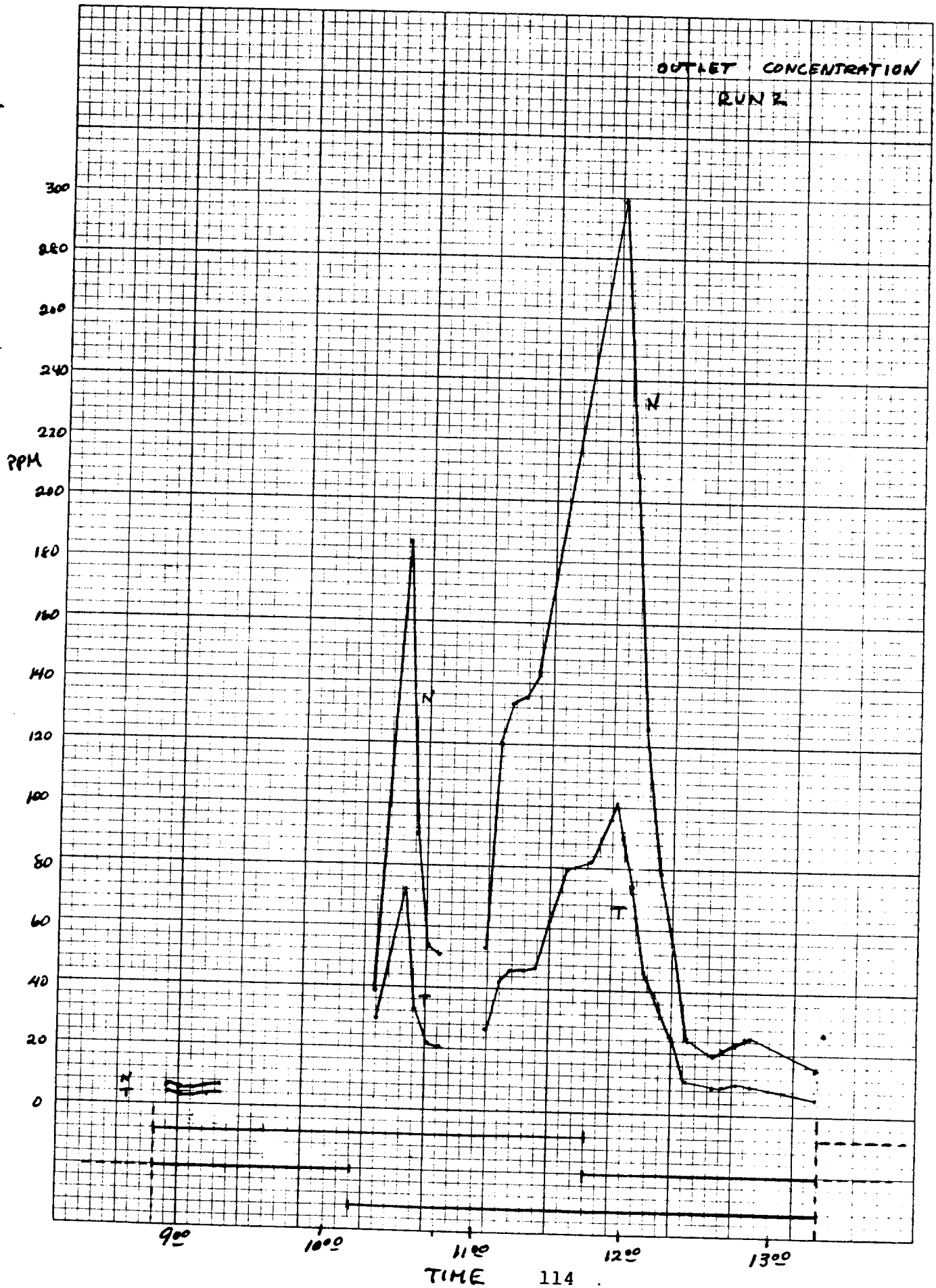
$$26.8 \times \frac{115.92}{96} = 32.4\ kg\ Nap.$$

$$32.4 \times \frac{.2642}{.742} = 11.5\ gal\ Na.$$

Total kg Carbon 15.4 + 26.8 = 42.2

Total Solvent 5.15
11.5
16.65 gal. in 270 min
= 3.7 gal/hr.

TGNMO $$\frac{0.164\ mg/l \times 1000 \times 1716 \times 270}{1 \times 10^6} = 76.0\ kg\ Carbon.$$



46 0782
K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

61,700 × .02832 = 1747 m³/min

RUN 2 OUTLET

TIME	MIN	TOLUENE ppm	TOLUENE cxt	NAPHTHA ppm	NAPHTHA cxt
850-1020	90	3.7	333	6.2	558
1020-1025	5	40	200	70	350
1025-1030	5	60	300	150	750
1030-1035	5	50	250	160	800
1035-1040	5	28	140	90	450
1040-1045	5	21	105	52	260
1045-1105	20	20	400	52	1040
1105-1110	5	34	170	90	450
1110-1115	5	44	220	128	640
1115-1125	10	47	470	138	1380
1125-1130	5	54	270	160	800
1130-1135	5	62	310	184	920
1135-1140	5	80	400	208	1040
1140-1145	5	82	410	230	1150
1145-1150	5	84	420	254	1270
1150-1155	5	94	470	284	1420
1155-1200	5	96	480	280	1400
1200-1205	5	80	400	220	1100
1205-1210	5	54	270	150	750
1210-1215	5	40	200	92	460
1215-1220	5	30	150	70	350
1220-1225	5	16	80	40	200
1225-1230	5	10	50	23	115
1230-1300	30	10	300	22	660
1300-1320	20	7	140	18	360
			wgt Avg 25.7		wgt. Avg 69.2

Carbon eq. 25.7 × 7 = 179.9 ppm.

mg/m³ 179.9 × .499 = 89.8

Kg as carbon $\frac{89.8 \times 270 \times 1747}{1 \times 10^6} = 42.4$

42.4 Kg carbon × $\frac{92.13}{84}$ = 46.5 Kg T

Gal of T = $\frac{46.5 \times .2642}{.866} = 14.2$

69.2 × 8 = 553.3 ppm.

553.3 × .499 = 276.1

$\frac{276.1 \times 270 \times 1747}{1 \times 10^6} = 130.2$

130.2 × $\frac{115.92}{96}$ = 157.3 Kg Nap.

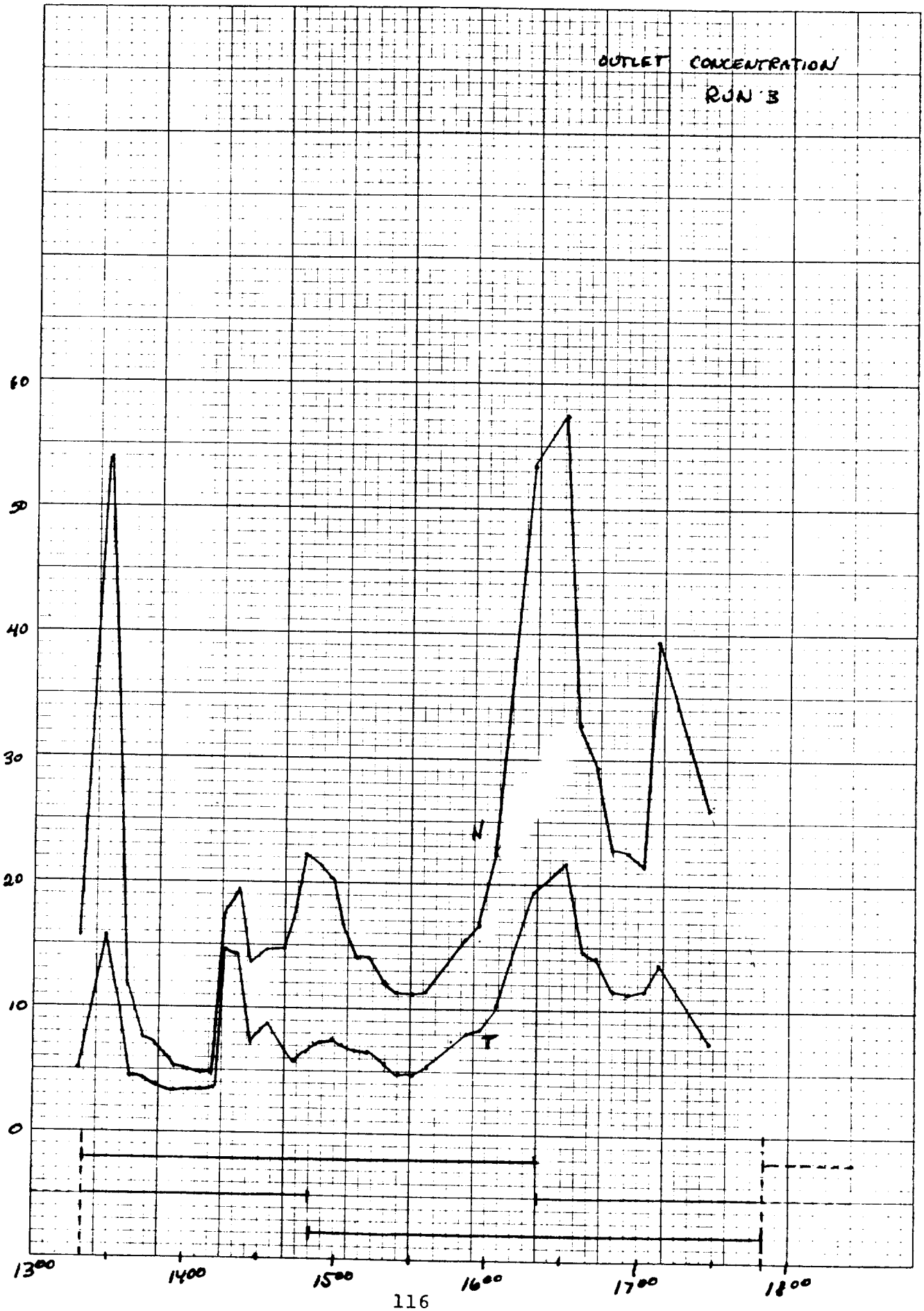
Gal of N = $\frac{157.3 \times .2642}{.742} = 56.0$

Total Solvent

14.2 + 56.0 = 70.2

Total Kg carbon 42.4 + 130.2 = 172.6

T6NMO $\frac{0.200 \times 1000 \times 1747 \times 270}{1 \times 10^6} = 94.3$



46 0782
K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

61,400 acfm x .02832 = 1739.

RUN 3 OUTLET

TIME	MIN	TOLUENE ppm	TOLUENE C x MIN	NAPHTHA ppm	NAPHTHA C x MIN
13:20-13:30	10	10	100	35	350
13:30-13:40	10	9	90	34	340
13:40-13:50	10	4	40	8	80
13:50-14:00	10	3.5	35	6	60
14:00-14:10	10	3.5	35	5	50
14:10-14:20	10	10	100	14	140
14:20-14:30	10	10	100	16	160
14:30-14:40	10	8	80	14.8	148
14:40-14:50	10	6.2	62	17	170
14:50-15:00	10	7	70	21	210
15:00-15:10	10	7	70	17	170
15:10-15:20	10	6	60	13.2	132
15:20-15:30	10	5	50	11.5	115
15:30-15:40	10	5.5	55	11.5	115
15:40-15:50	10	7	70	14	140
15:50-16:00	10	8.5	85	15.8	158
16:00-16:10	10	11.5	115	26	260
16:10-16:20	10	17	170	45	450
16:20-16:30	10	20.5	205	55.5	555
16:30-16:40	10	17	170	45	450
16:40-16:50	10	13	130	27	270
16:50-16:00	10	11.2	112	22.2	222
17:00-17:10	10	12.5	125	31	310
17:10-17:20	10	12.0	120	35	350
17:20-17:30	10	8.5	85	29	290
17:30-17:50	20	7.0	140	19	380
			Wgt Avg 9.2		Wgt Avg. 22.5

Carbon eq. 9.2 x 7 = 64.4 ppm.

mg/m³ = 64.4 x .499 = 32.1

Kg as carbon = $\frac{32.1 \times 1739 \times 270}{1 \times 10^6}$ = 15.1

15.1 kg as Carbon x $\frac{92.13}{84}$ = 16.6 kg Tol.

Gal of T = $\frac{16.6 \times .2642}{.866}$ = 5.1

22.5 x 8 = 180 ppm.

180 x .499 = 89.8

Kg as carbon = $\frac{89.8 \times 1739 \times 270}{1 \times 10^6}$ = 42.2

42.2 kg Carbon x $\frac{115.92}{96}$ = 50.9 kg N

Gal of N = $\frac{50.9 \times .2642}{.742}$ = 18.1

Total Gals. 5.1 + 18.1 = 23.2

Total Kg Carbon 15.1 + 42.2 = 57.3

TGNMO $\frac{0.256 \times 1000 \times 1739 \times 270}{1 \times 10^6}$ = 120.2

APPENDIX I

FLOOR SWEEP DATA - GC/FID

Run 1

(TEXAS KCOLOR)

N.E. & S.W. VENTS

Sample & Time Run Number	Range	Attenuation	Naptha 1 MM PK HT	Naptha 2 MM PK HT	Naptha 3 MM PK HT	Toluene MM PK HT	Xylene MM PK HT	PPm Naptha 1	PPm Naptha 2	PPm Naptha 3	PPm Toluene	PPm Xylene
4/11/79												
2010 STD	10^2	16				173 MM					691.5	
2010 STD	10^2	16				170 MM					1924.5	
505 STD	10^2	4				171 MM					573.9	
505 STD	10^2	4				166 MM					499.5	
100 STD	10^2	2				39 MM					76	
1030 STD	10^2	8				147 MM					569	
1030 STD	10^2	8				148 MM						
8 PPm STD	10	1				35 MM						
8 PPm STD	10	1				35 MM						
S.WEST VENTS												
1530 - 1	10^2	1	60 MM	67 MM	36 MM	97 MM	8 MM		146.1		98.0	6.59
1530 - 2	10^2	1	59 MM	60 MM	32 MM	91 MM	9 MM		133.8		~~93.7~~	7.42
1530 - 3	10^2	1	55 MM	62 MM	32 MM	88 MM	8 MM		135.9		91.5	6.59
N.EAST VENT												
1540 - 1	10^2	1	80 MM	90 MM	47 MM	125 MM	16 MM		185.5		119.4	13.2
1540 - 2	10^2	1	72 MM	78 MM	46 MM	114 MM	13 MM		170.2		110.4	10.7
1540 - 3	10^2	1	80 MM	88 MM	47 MM	120 MM	10 MM		184.0		114.8	8.24
Inlet												
1545 - 1	10^2	2	127	87	88	47	16		467.6		271.7	26.4
1545 - 2	10^2	2	131	105	54	166	6		450.0		26.8	9.89
S.W. Vent												
1720 - 1	10^2	1	80	96	53	129	15		194.3		121.4	12.4
1720 - 2	10^2	1	86	109	56	141	20		210.3		~~121.6~~ 130.1	16.5
N.E												
1715 - 1	10^2	1	69	86	47	112	18		174.6		109.0	14.8
1715 - 2	10^2	1	68	86	47	118	16		173.8		~~109.0~~ 113.3	13.2
Inlet												
1815 - 1	10^2	2	88	110	55	127	18		396.1		254.0	29.7
1815 - 2	10^2	2	80	100	48	112	19		359.7		~~241.6~~ 224.0	31.3
S.W Vent												
1740 - 1	10^2	1	78	99	52	129	19		194.3		124.4	15.7
1740 - 2	10^2	1	76	97	49	126	19		189.1		~~119.0~~ ~~119.6~~ 119.2	15.7
N.E Vent												
1845 - 1	10^2	1	127	138	70	190	22		271.5		165.8	18.1
1845 - 2	10^2	1	130	142	72	197	23		278.1		~~159.0~~ ~~163.7~~ 170.9	19.0
100 PPm STD	10^2	2				50						
100 PPm STD	10^2	2				51						
103 PPm STD	10^2	2				52						
103 PPm STD	10^2	2				51						
1020 PPm STD	10^2	16				94						
1020 PPm STD	10^2	16				89						
Audit 674	10^2	4				167					502.4	
Audit 674	10^2	4				167					502.4	

TEXAS COLOR

N.E. and S.W. VENTS

SAMPLE and TIME RUN NUMBER Run # 2	RANGE	ATTENUATION	NAPTHA 1 mm Pk Ht	NAPTHA 2 mm Pk Ht	NAPTHA 3 mm Pk Ht	TOLUENE mm Pk Ht	XYLENE mm Pk Ht	NAPTHA 1 PPM	NAPTHA 2 PPM	NAPTHA 3 PPM	TOLUENE PPM	XYLENE PPM
1030 PPM STD	10^2	16										
1030 PPM STD	10^2	16				94					1042.1	
100 PPM STD	10^2	2				93					1031.7	
100 PPM STD	10^2	2				61					106.6	
505 PPM STD	10^2	8				64					110.7	
505 PPM STD	10^2	8				86					489.7	
						86					489.7	
AUDIT 674	10^2	4										
AUDIT 674	10^2	4				169					481.6	
						160					457.3	
SOLVENT #1 BAG	10^2	8	4	5	2	10						
SOLVENT #1 BAG - ASTM			7	7	4	11					78.2	
											83.6	
S.W. VENT												
0920-1	10^2	1	100	138	71	165	14		233.5		135.7	11.5
0920-2	10^2	1	102	141	72	164	15		237.5		135.0	12.4
N.E VENT												
0925-1	10^2	1	140	167	86	215	21		290		169.5	17.3
0925-2	10^2	1	132	158	83	205	21		277		162.8	17.3
SOLVENT MAX 0.159 ft^3	10^2	1	26	19	9	28						
SOLVENT MIN	10^2	1	19	19	9	29					43.0	
											43.6	
INLET	10^2	2	136	135	68	170	10		483		254.2	16.5
INLET	10^2	2	131	130	67	166	10		468		248.7	16.5
S.W. VENT												
1040-1	10^2	1	127	168	89	216	22		284		170.2	18.1
1040-2	10^2	1	125	165	87	210	21		279		166.2	17.3
N.E. VENT												
1045-1	10^2	1	121	146	79	200	20		259		159.4	16.5
1045-2	10^2	1	117	141	75	191	19		250		153.3	15.7
SOLVENT STD 10 µl in .162 ft^3	10^2	1	140	130	62	194	15				155.3	12.4
10 µl in .162 ft^3-2	10^2	1	133	123	59	184	15				148.6	12.4
INLET												
1150-1	10^2	4	39	49	24	58	5		328		181.1	16.5
1150-2	10^2	2	76	94	46	111	7		317		174.3	11.5
S.W. VENT												
1210-1	10^2	2	24	34	17	44	2		126		83.5	3.3
1210-2	10^2	1	30	71	35	91	6		130		85.6	4.9
N.E. VENT												
1215-1	10^2	1	24	40	21	54	6		82.0		60.6	4.95
1215-2	10^2	1	24	38	20	50	4		97.5		57.9	3.30
SOLVENT			124	115	55	166	12				136.4	9.89
N.E. VENT												
1320-1	10^2	1	85	84	44	127	10		269		110.0	8.24
1320-2	10^2	1	85	86	44	128	11		170		110.7	9.10
S.W. VENT												
1318-1	10^2	1	62	70	37	108	10		139		97.1	8.2
1318-2	10^2	1	61	68	34	106	10		135		95.8	8.2

TEXAS COLOR

N.E. and S.W. VENTS

SAMPLE ! TIME RUN NUMBER	RANGE	ATTENUATION	NAPTHA 1 mm PEAK	NAPTHA 2 mm PEAK	NAPTHA 3 mm PEAK	TOLUENE mm PEAK	XYLENE mm PEAK	NAPTHA 1 PPM	NAPTHA 2 PPM	NAPTHA 3 PPM	TOLUENE PPM	XYLENE PPM
Run #3												
300 PPM STD	10^2	8				49					289.4	
300 PPM STD	10^2	4				96					283.9	
S.W. VENT												
1450-1	10^2	1	98	128	65	161	14		225		133.0	11.5
1450-2	10^2	1	97	129	65	160	15		225		132.3	12.4
N.E. VENT												
1455-1	10^2	1	92	115	60	154	16		213		128.3	13.2
1455-2	10^2	1	109	136	71	183	17		238.5		147.9	14.0
INLET												
1515-1	10^2	2	82	112	55	134	17				205.4	28.0
1515-2	10^2	2	84	106	52	126	16				194.5	26.4
AUDIT 624	10^2	4				172					489.7	
AUDIT 624	10^2	4				166					473.5	
295 PPM STD	10^2	4				112					327.3	
295 PPM STD	10^2	4				111					324.6	
S.W. VENT												
1600-1	10^2	1	104	143	75	181	23		243		146.5	19.0
1600-2	10^2	1	109	144	75	181	22		243		146.5	18.1
N.E. VENT												
1605-1	10^2	1	124	157	83	208	25		263.4		164.8	20.6
1605-2	10^2	1	122	154	79	202	24		258.8		160.7	19.8
INLET												
1705-1	10^2	4	139	137	64	174	13				495.1	42.9
1705-2	10^2	4	135	134	64	170	13				487.0	42.9
SOLVENT												
10 µl	10^2	1	146	137	65	195	16				156.0	13.2
S.W. VENT												
1735-1	10^2	1	124	167	87	215	29		265		169.5	23.9
1735-2	10^2	1	118	158	82	202	26				160.7	21.4
N.E. VENT (VALVE OPEN - BAGLOW)												
1740-1	10^2	1	147	174	91	228	27		285.4		178.3	22.3
1740-2	10^2	1	130	154	81	204	24		264		162.1	19.8
INLET												
1745-1	10^2	4	146	146	72	185	15				524.9	49.5
1745-2	10^2	4	149	151	73	191	16				541.2	52.8
295 PPM STD	10^2	4				107					313.7	
295 PPM STD	10^2	4				107					313.7	
AUDIT 624	10^2	4				186					527.6	
AUDIT 624	10^2	4				191					541.2	
AUDIT 624	10^2	4				190					538.5	
100 PPM STD	10^2	2				56					99.8	
100 PPM STD	10^2	2				56					99.8	
505 PPM STD	10^2	8				99					560.0	
505 PPM STD	10^2	8				104					587.2	
505 PPM STD	10^2	8				110					619.7	
1030 PPM STD	10^2	16				115					1269.5	

NE VENT RUN 1

7,690 acfm × .02832 = 217.8 m³/min

TIME	MIN	MATERIAL	ppm	CARBON EQ. ppm	CARBON EQ. mg/m³	CARBON EQ. Kg
1540	115	NAP.	179.9	1439	719	18.0
1715	50	NAP	174.2	1394	695	7.6
1740	105	NAP	191.7	1534	765	17.5
				Wgt Avg 1468	Wgt Avg 732	43.1
1540	115	TOL	114.5	802	400	10.0
1715	50	TOL	111.2	778	388	4.2
1740	105	TOL	120.3	842	420	9.6
				Wgt Avg = 812.7	Wgt Avg = 406	Tot = 23.8
1540	115	XYL.	10.7	85.6	42.7	1.1
1715	50	XYL.	14.0	112	55.9	0.6
1740	105	XYL.	15.7	126	62.7	1.4
				Wgt Avg = 106	Wgt Avg = 52.9	Tot = 3.1

GALS NAP = $43.1 \times \frac{115.92}{96} \times \frac{.2642}{.742}$ = 18.5 Gals.

GALS TOL = $23.8 \times \frac{92.13}{84} \times \frac{.2642}{.866}$ = 8.0 Gals.

GALS XYL. $3.1 \times \frac{106}{96} \times \frac{.2642}{.861}$ = 1.1

Total = 27.6 gals Solv.

Total Kg Carbon = 43.1 + 23.8 + 3.1 = 70.0

TGNMO (1) $\frac{1.057 \times 1000 \times 217.8 \times 270}{1 \times 10^6}$ = 62.2 Kg Carbon

(2) $\frac{1.170 \times 1000 \times 217.8 \times 270}{1 \times 10^6}$ = 68.8 Kg Carbon

7,850 × .02832 = 222.3 m³/min

NE Vent Run 2

TIME	MIN	MATERAL	ppm	CARBON EQ. ppm	mg/m³	Kg
925	90	NAP.	283.5	2268	1132	22.6
1045	100	"	254.1	2033	1014	22.5
1215	40	"	89.8	718	358	3.2
1320	40	"	169.2	1354	675	6.0
			WAvg = 227	WAvg 1816	W.Avg = 906	54.4
925	90	TOL	166.2	1163	581	11.6
1045	100	"	156.4	1095	546	12.1
1215	40	"	59.2	414	207	1.8
1320	40	"	110.4	773	386	3.4
			WAvg = 138	W.Avg = 969	WAvg. 484	29.0
925	90	XYL	17.3	138	69.1	1.4
1045	100	"	16.1	129	64.3	1.4
1215	40	"	4.1	32.8	16.4	0.2
1320	40	"	8.7	69.6	34.7	0.3
			WAvg = 13.6	WAvg 109.1	WAvg = 54.4	3.3

GALS NAP - $54.4 \times \frac{115.92}{96} \times \frac{.2642}{.742}$ = 23.4 gals. Naphtha

GAL TOL = $29.0 \times \frac{92.13}{84} \times \frac{.2642}{.866}$ = 9.7 gals. Toluene

GAL XYL = $3.3 \times \frac{106}{96} \times \frac{.2642}{.866}$ = 1.1 gal Xylene

34.2 Gals.

Total Kg Carbon = 54.4 + 29.0 + 3.3 = 86.7 Kg Carbon

TGNMO $\frac{2.177 \times 1000 \times 222.3 \times 270}{1 \times 106}$ = 130.7 Kg Carbon

7,850 × .02832 = 222.3

NE VENT RUN 3

TIME	MIN	MATERIAL	ppm	CARBON EQUIV. ppm	mg/m³	Kg
1455	80	NAP	225.7	1805.6	901	16.0
1605	95	"	261.1	2088.8	1042.3	22.0
1740	95	"	276.2	2209.6	1102.6	23.3
				Wgt Avg: 2047	W Avg = 1022	61.3
1455	80	TOL	138.1	966.7	482	8.6
1605	95	TOL	162.8	1139.6	568.7	12.0
1740	95	TOL	170.2	1194.4	594.5	12.6
				WAvg 1106	WAvg = 552	33.1
1455	80	XYL	13.6	108.8	54.3	1.0
1605	95	"	20.2	161.6	80.5	1.7
1740	95	"	21.1	168.8	84.2	1.8
				WAvg: 148.4	WAvg 74.0	4.4

GALS. NAP = $61.3 \times \frac{115.92}{96} \times \frac{.2642}{.742}$ = 26.4 gals

GALS TOL. = $33.1 \times \frac{92.13}{84} \times \frac{.2642}{.866}$ = 11.1 gal Tol.

GALS XYL. = $4.4 \times \frac{106}{96} \times \frac{.2642}{.861}$ = 1.5

39.0 gals.

Total Kg Carbon 61.3 + 33.1 + 4.4 = 98.8 Kg carbon F.I.D

T6 NMO $\frac{1.232 \times 1000 \times 222.3 \times 270}{1 \times 10^6}$ = 73.9 kg Carbon total

$\frac{1.382 \times 1000 \times 222.3 \times 270}{1 \times 10^6}$ = 82.9 Kg carbon total

Vel = 10,100 x .02832 = 286.0

S.W Vent Run 1

TIME	MIN	MATERIAL	ppm	Carbon Eq. ppm	mg/m³	Kg
1530	115	NAP	138.6	1109	553	18.2
1720	50	"	202.3	1618	808	11.6
1740	105	"	191.7	1534	765	23.0
				WAvg 1368	WAvg 683	52.8
1530	115	TOL	94.4	661	330	10.9
1720	50	"	125.8	881	439	6.3
1740	105	"	120.3	842	420	12.6
				WAvg 772	WAvg 385	29.7
1530	115	XYL	6.9	55.2	27.5	0.9
1720	50	"	14.5	116	57.9	0.8
1740	105	"	15.7	126	62.7	1.9
				WAvg 93.8	WAvg 46.8	3.6

Gal NAP. $52.8 \times \frac{115.92}{96} \times \frac{.2642}{.742} = 22.7$ gals Nap

GAL TOL $29.7 \times \frac{92.13}{84} \times \frac{.2642}{.866} = 10.0$ gal Tol

GAL XYL. $3.6 \times \frac{106}{96} \times \frac{.2642}{.861} = 1.2$

33.9 gals.

Total Kg carbon 52.8 + 29.7 + 3.6 = 86.1

T6NMO $\frac{1.033 \times 1000 \times 286 \times 270}{1 \times 10^6} = 79.8$

S.W. Vent Run 2

Vel 11,900 cfm x .02832 = 337 m^3/min

TIME	MIN	MAT	ppm	Carbon Eq. ppm	mg/m3	Kg
920	90	NAP	235.5	1884	940	28.5
1040	100	"	281.8	2254	1125	37.9
1210	40	"	129.9	1023	510	6.9
1318	40	"	136.8	1094	546	7.4
				WAvg 1776	WAvg 886	80.7
920	90	TOL	135.3	950	474	14.4
1040	100	"	168.2	1177	587	19.8
1210	40	"	84.6	592	296	4.0
1318	40	"	96.5	675	337	4.5
				WAvg 940	WAvg 469	42.7
920	90	XYL	12	96	47.9	1.5
1040	100	"	17.7	142	70.7	2.4
1210	40	"	4.1	32.8	16.4	0.2
1318	40	"	8.2	65.6	32.7	0.4
				WAvg = 99.0	WAvg = 49.4	4.5

Gal Nap $80.7 \times \frac{115.92}{96} \times \frac{.2642}{.742} = 34.7$ gals.

Gal Tol $42.7 \times \frac{92.13}{84} \times \frac{.2642}{.866} = 14.3$ gals.

Gal Xyl. $4.5 \times \frac{106}{96} \times \frac{.2642}{.861} = 1.5$ gals

50.5 gals

~~Total~~ Carbon Kg $80.7 + 42.7 + 4.5 = 127.9$

T6NMO $\frac{1.833 \times 337 \times 270 \times 1000}{1 \times 10^6} = 166.8$

$\frac{2.161 \times 337 \times 270 \times 1000}{1 \times 10^6} = 196.6$

Vel. 11,900 x .02832 = 337 m³/min

SW Vent Run 3

TIME	MIN	MAT	ppm	CARBON EQUIV ppm	mg/m³	Kg
1450	75	NAP	225	1800	898	22.7
1600	95	"	243	1944	970	31.1
1735	100	"	265	2120	1058	35.7
				WAvg 1969	WAvg 983	89.4
1450	75	TOL	132.7	929	464	= 11.7
1600	95	"	146.5	1026	512	16.4
1735	100	"	165.1	1156	577	19.4
				WAvg 1048	WAvg 523	47.6
1450	75	XYL	12.0	96	47.9	1.2
1600	95	"	18.6	149	74.4	2.4
1735	100	"	22.6	181	90.3	3.0
				WAvg 146	WAvg 72.9	6.6

Gal Nap $89.4 \times \frac{115.92}{96} \times \frac{.2642}{.742} = 38.4$ gal

Gal Tol $47.6 \times \frac{92.13}{84} \times \frac{.2642}{.866} = 15.9$ gal

Gal Xyl $6.6 \times \frac{106}{96} \times \frac{.2642}{.861} = 2.2$ gals

56.5

Total Carbon $89.4 + 47.6 + 6.6 = 143.6$

TGNMO $\frac{1.585 \times 1000 \times 337 \times 270}{1 \times 10^6} = 144.2$

$\frac{0.984 \times 1000 \times 337 \times 270}{1 \times 10^6} = 89.5$

APPENDIX J

TGNMO ANALYTICAL DATA SHEETS

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 765

CLIENT Monsanto - EPA

DATE TRAP ANALYSIS

PROJECT NO. 118-1

DATE TANK ANALYSIS 5/6/79

TEST NO. TC-AI-1

ANALYST

TRAP NO. 15 TANK NO. 27

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 731 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 730 mm Hg

$P_{T(2)}$ 333 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 462 mm Hg - Final Pressure

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(730) - (333)] - [(733) - (731)]}{[(76) + 460] \times 0.299}$$

V_S = 2.465 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 141 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(2)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(462) + (730)]}{[(730) - (333)] - [(733) - (731)]} \times (141)$$

$C_{VOC(2)}$ = 450 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.225 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.554 mg Carbon in Tank

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 765 1'

CLIENT Monsanto - EPA

DATE TRAP ANALYSIS

PROJECT NO. 118-1

DATE TANK ANALYSIS 5/8/79

TEST NO. TC - AI - 1

ANALYST

TRAP NO. 15 TANK NO. 31

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 730 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 730 mm Hg

$P_{T(2)}$ 328 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 209 mm Hg - Final Pressure $P_{B(3)}$ = 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(730) - (328)] - [(733) - (730)]}{[(76) + 460] \times 0.299}$$

V_S = 2.490 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 167 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(209) + (741)]}{[(730)-(328)] - [(733)-(730)]} \times (167)$$

$C_{VOC(2)}$ = 398 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.199 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.495 mg Carbon in Tank

TRAP ANALYSIS #15

Collection Vessel No. 1

Volume of Collection Vessel 0.885 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 739 mm Hg - Initial Vacuum

$P_{CV(2)}$ 370 mm Hg - Final Pressure

T = 86°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 26200 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (26200) \times \left[(370) + (739)\right]\left[\frac{3.467 \times 10^{-4}\ (0.885)}{(86 + 460)}\right]$$

$M_{n(2)}$ = 16.33 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (1.049) + (16.33)$$

Mn_T = 17.38 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{SV}} = \frac{(17.38)}{(4.955)} = 3.507$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 99.33

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 766

CLIENT Monsanto-EPA

DATE TRAP ANALYSIS 5/10/79

PROJECT NO. 118-1

DATE TANK ANALYSIS 5/7/79

TEST NO. TC-AO-1

ANALYST [illegible]

TRAP NO. 27 TANK NO. 17

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 730 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 731 mm Hg

$P_{T(2)}$ 366 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 447 mm Hg - Final Pressure

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(731) - (366)] - [(733) - (730)]}{[(76) + 460] \times 0.299}$$

V_S = 2.259 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 43 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(2)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(447) + (731)]}{[(731) - (366)] - [(733) - (730)]} \times (43)$$

$C_{VOC(2)}$ = 134140 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.067 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.159 mg Carbon in Tank

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- [illegible]

CLIENT [illegible]

DATE TRAP ANALYSIS

PROJECT NO. [illegible]

DATE TANK ANALYSIS 5/9/79

TEST NO. [illegible]

ANALYST D.H.

TRAP NO. [illegible] TANK NO. 35, ~~X~~

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 731 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 731 mm Hg

$P_{T(2)}$ 363 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 213 mm Hg - Final Pressure $P_{B(3)}$ 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{\left[P_{B(2)} - P_{T(2)}\right] - \left[P_{B(1)} - P_{T(1)}\right]}{(T + 460) \times 0.299}$$

$$V_S = \frac{\left[(\ 731\ ) - (\ 363\ )\right] - \left[(\ 733\ ) - (\ 731\ )\right]}{\left[(\ 76\ ) + 460\right] \times 0.299}$$

V_S = ~~8.284~~ 2.284 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 68 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{\left[P_{T(3)} + P_{B(3)}\right]}{\left[P_{B(2)} - P_{T(2)}\right] - \left[P_{B(1)} - P_{T(1)}\right]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{\left[(\ 213\ ) + (\ 741\ )\right]}{\left[(\ 731\ ) - (\ 363\ )\right] - \left[(\ 733\ ) - (\ 731\ )\right]} \times (\ 68\ )$$

$C_{VOC(2)}$ = 177 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.089 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.002 mg Carbon in Tank

TRAP ANALYSIS #27

Collection Vessel No. 6

Volume of Collection Vessel 1000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 738 mm Hg - Initial Vacuum

$P_{CV(2)}$ 259 mm Hg - Final Pressure

T = 83°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 602 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (602) \times \left[(259) + (738)\right]\left[\frac{3.467 \times 10^{-4}\ (1000)}{(83 + 460)}\right]$$

$M_{n(2)}$ = 0.383 mg

$Mn_T = Mn_{(1)} + Mn_{(2)}$

ppm trap ~~[illegible]~~

Mn_T = (0.360) + (0.383)

Mn_T = ~~0.746~~ 0.743 mg Carbon

mg Carbon/liter = $\frac{Mn_T}{V_{sv}}$ = $\frac{(0.743)}{(4.538)}$ = 0.164

mg Carbon/DSCF = mg Carbon/liter X 28.32

= ~~4.60~~ 4.63

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 767

CLIENT Monsanto - EPA

DATE TRAP ANALYSIS 5/9/79

PROJECT NO. 118-1

DATE TANK ANALYSIS 5/8/79

TEST NO. TC-AI-2

ANALYST [illegible]

TRAP NO. 35 TANK NO. 23

TANK INITIAL

$P_{B(1)}$ 731 mm Hg

$P_{T(1)}$ 728 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 737 mm Hg

$P_{T(2)}$ 318 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 253 mm Hg - Final Pressure $P_{B(3)}$ = 741 mm Hg

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(737) - (318)] - [(731) - (728)]}{[(76) + 460] \times 0.299}$$

V_S = 2.596 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 635 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(253) + (741)]}{[(737) - (318)] - [(731) - (728)]} \times (635)$$

$C_{VOC(2)}$ = 1517 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.758 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 1.964 mg Carbon in Tank

TCA SAMPLE ANALYTICAL SHEET

CLIENT [illegible]

PROJECT NO. [illegible]

TEST NO. [illegible]

PCS SAMPLE #79- [illegible]

DATE TRAP ANALYSIS

DATE TANK ANALYSIS 5/8/79

ANALYST [illegible]

TRAP NO. 35 TANK NO. 47

TANK INITIAL

$P_{B(1)}$ 731 mm Hg

$P_{T(1)}$ 728 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 737 mm Hg

$P_{T(2)}$ 328 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 217 mm Hg - Final Pressure $P_{B(3)}$ = 741 mm Hg

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(737) - (328)] - [(731) - (728)]}{[(76) + 460] \times 0.299}$$

V_S = 2.533 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 193 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(217) + (741)]}{[(737)-(328)] - [(731)-(728)]} \times (193)$$

$C_{VOC(2)}$ = 455 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.228 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.576 mg Carbon in Tank

TRAP ANALYSIS #35

Collection Vessel No. 1

Volume of Collection Vessel 0.885 liters - V_{CV}

$P_{B(2)}$ 746 mm Hg

$P_{CV(1)}$ 741 mm Hg - Initial Vacuum

$P_{CV(2)}$ 434 mm Hg - Final Pressure

T = 84°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ ~~375000~~ 37500 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (\cancel{375000}\ 37500) \times \left[(434) + (741)\right]\left[\frac{3.467 \times 10^{-4}\ (0.885)}{(84 + 460)}\right]$$

$M_{n(2)}$ = 2.485 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (2.544) + (2.485)$$

Mn_T = ~~5.411~~ 5.029 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(\cancel{5.411}\ 5.029)}{(5.129)} = \cancel{4.45}\ 5.341$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= ~~1386~~ 151.3

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 768

CLIENT Monsanto - EPA

DATE TRAP ANALYSIS 5/14/79

PROJECT NO. 118-1

DATE TANK ANALYSIS 5/17/79

TEST NO. TC-A0-2

ANALYST [illegible]

TRAP NO. 3 TANK NO. 20

TANK INITIAL

$P_{B(1)}$ 730 mm Hg

$P_{T(1)}$ 728 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 737 mm Hg

$P_{T(2)}$ 480 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 196 mm Hg - Final Pressure $P_{B(3)}$ = 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(737) - (480)] - [(730) - (728)]}{[(76) + 460] \times 0.299}$$

V_S = 1.591 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 46 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(196) + (741)]}{[(737)-(480)] - [(730)-(728)]} \times (46)$$

$C_{VOC(2)}$ = 169 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.084 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.134 mg Carbon in Tank

TCA SAMPLE ANALYTICAL SHEET

CLIENT [illegible]

PROJECT NO. [illegible]

TEST NO. [illegible]

PCS SAMPLE #79- [illegible]

DATE TRAP ANALYSIS

DATE TANK ANALYSIS 5/8/79

ANALYST [illegible]

TRAP NO. 3 TANK NO. 32

TANK INITIAL

$P_{B(1)}$ 730 mm Hg

$P_{T(1)}$ 728 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 737 mm Hg

$P_{T(2)}$ 513 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 254 mm Hg - Final Pressure $P_{B(3)}$ = 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(737) - (513)] - [(730) - (728)]}{[(76) + 460] \times 0.299}$$

V_S = 1.385 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 101 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(254) + (741)]}{[(737)-(513)] - [(730)-(728)]} \times (101)$$

$C_{VOC(2)}$ = 453 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.226 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.313 mg Carbon in Tank

TRAP ANALYSIS # 3

Collection Vessel No. 2

Volume of Collection Vessel 1000 liters - V_{CV}

$P_{B(2)}$ 747 mm Hg

$P_{CV(1)}$ 730 mm Hg - Initial Vacuum

$P_{CV(2)}$ 254 mm Hg - Final Pressure

T = 74°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 231 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (231) \times \left[(254) + (730)\right]\left[\frac{3.467 \times 10^{-4} (1000)}{(74 + 460)}\right]$$

$M_{n(2)}$ = 0.146 mg

$Mn_T = Mn_{(1)} + Mn_{(2)}$

Mn_T = (0.448) + (0.146)

Mn_T = 0.596 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(0.596)}{(2.976)} = 0.200$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 5.67

TCA SAMPLE ANALYTICAL SHEET

CLIENT Monsanto -EPA
PROJECT NO. 118-1
TEST NO. TC-AI-3

PCS SAMPLE #79- 769
DATE TRAP ANALYSIS 5/14/79
DATE TANK ANALYSIS 5/21/79
ANALYST [illegible]

TRAP NO. 88 TANK NO. 45

TANK INITIAL

$P_{B(1)}$ 737 mm Hg

$P_{T(1)}$ 734 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 736 mm Hg

$P_{T(2)}$ 354 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 252 mm Hg - Final Pressure $P_{B(3)}$ = 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(736) - (354)] - [(737) - (734)]}{[(76) + 460] \times 0.299}$$

V_S = 2.365 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 131 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(252) + (741)]}{[(736)-(354)] - [(737)-(734)]} \times (131)$$

$C_{VOC(2)}$ = 343 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.171 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.406 mg Carbon in Tank

TCA SAMPLE ANALYTICAL SHEET

CLIENT [illegible]
PROJECT NO. [illegible]
TEST NO. [illegible]

PCS SAMPLE #79- [illegible]
DATE TRAP ANALYSIS
DATE TANK ANALYSIS 5/9/79
ANALYST [illegible]

TRAP NO. 38 TANK NO. 44

TANK INITIAL

$P_{B(1)}$ 737 mm Hg

$P_{T(1)}$ 737 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 736 mm Hg

$P_{T(2)}$ 343 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 253 mm Hg - Final Pressure $P_{B(3)}$ = 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(736) - (343)] - [(\quad 0 \quad)]}{[(76) + 460] \times 0.299}$$

V_S = 2.452 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 187 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(253) + (741)]}{[(736)-(343)] - [(737)-(737)]} \times (187)$$

$C_{VOC(2)}$ = 473 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.236 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.579 mg Carbon in Tank

TRAP ANALYSIS #88

Collection Vessel No. 2

Volume of Collection Vessel 1000 liters - V_{CV}

$P_{B(2)}$ 747 mm Hg

$P_{CV(1)}$ 143 mm Hg - Initial Vacuum

$P_{CV(2)}$ 367 mm Hg - Final Pressure

T = 75°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 35800 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (35800) \times \left[(367) + (743)\right]\left[\frac{3.467 \times 10^{-4}\ (1000)}{(75 + 460)}\right]$$

$M_{n(2)}$ = ~~2575~~ 25.75 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (0.985) + (\cancel{2575}\ 25.75)$$

Mn_T = ~~2585~~ 26.74 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(\cancel{2585}\ 26.74)}{(4.817)} = \cancel{5367}\ 5,550$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= ~~1570~~ 1572

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 770

CLIENT Monsanto - EPA

DATE TRAP ANALYSIS 5/29/79

PROJECT NO. 118-1

DATE TANK ANALYSIS 5/7/79

TEST NO. TC-A0-3

ANALYST [illegible]

TRAP NO. 87 TANK NO. 18

TANK INITIAL

$P_{B(1)}$ 737 mm Hg

$P_{T(1)}$ 737 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 736 mm Hg

$P_{T(2)}$ 467 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 253 mm Hg - Final Pressure $P_{B(3)}$ = 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(736) - (467)] - [(0)]}{[(76) + 460] \times 0.299}$$

V_S = 1.678 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 54 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(253) + (741)]}{[(736)-(467)] - [(737)-(737)]} \times (54)$$

$C_{VOC(2)}$ = 200 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.100 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.167 mg Carbon in Tank

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- [illegible]

CLIENT [illegible]

DATE TRAP ANALYSIS

PROJECT NO. [illegible]

DATE TANK ANALYSIS 5/8/79

TEST NO. [illegible]

ANALYST [illegible]

TRAP NO. 8 TANK NO. 29

TANK INITIAL

$P_{B(1)}$ 737 mm Hg

$P_{T(1)}$ 737 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 736 mm Hg

$P_{T(2)}$ 438 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 263 mm Hg - Final Pressure $P_{B(3)} = 741$

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(736) - (438)] - [(\quad) - (\quad)]}{[(76) + 460] \times 0.299}$$

V_S = 1.859 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 128 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(263) + (741)]}{[(736)-(438)] - [(737)-(737)]} \times (128)$$

$C_{VOC(2)}$ = 431 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.215 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.401 mg Carbon in Tank

TRAP ANALYSIS #87

Collection Vessel No. 52

Volume of Collection Vessel 1,000 liters - V_{CV}

$P_{B(2)}$ 746 mm Hg

$P_{CV(1)}$ 737 mm Hg - Initial Vacuum

$P_{CV(2)}$ 252 mm Hg - Final Pressure

T = 86°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 535 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (535) \times \left[(252) + (737)\right]\left[\frac{3.467 \times 10^{-4}\ (1,000)}{(86 + 460)}\right]$$

$M_{n(2)}$ = 0.336 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (0.568) + (0.336)$$

Mn_T = 0.904 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(0.904)}{(3.537)} = 0.256$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 7.24

TRAP ANALYSIS #21

Collection Vessel No. 3

Volume of Collection Vessel 1.000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 741 mm Hg - Initial Vacuum

$P_{CV(2)}$ 252 mm Hg - Final Pressure

T = 72 °F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 3510 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (3510) \times \left[(252) + (741)\right]\left[\frac{3.467 \times 10^{-4} (1.000)}{(72 + 460)}\right]$$

$M_{n(2)}$ = 2.271 mg

$Mn_T = Mn_{(1)} + Mn_{(2)}$

Mn_T = (0.275) + (2.271)

Mn_T = ~~0.2546~~ 2.546 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(2.546)}{(2.465)} = 1.033$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 29.27

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 711

CLIENT [illegible]

DATE TRAP ANALYSIS 5/10/79

PROJECT NO. [illegible]

DATE TANK ANALYSIS 5/7/79

TEST NO. TC WFS-1

ANALYST [illegible]

TRAP NO. 21 TANK NO. 4

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 730 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 731 mm Hg

$P_{T(2)}$ 333 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 444 mm Hg - Final Pressure

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(731) - (333)] - [(733) - (730)]}{[(76) + 460] \times 0.299}$$

V_S = 2.465 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 75 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(2)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(444) + (731)]}{[(731)-(333)] - [(733)-(730)]} \times (75)$$

$C_{VOC(2)}$ = 223 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.111 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.275 mg Carbon in Tank

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- [illegible]

CLIENT [illegible]

DATE TRAP ANALYSIS 5/10/79

PROJECT NO. [illegible]

DATE TANK ANALYSIS 5/7/79

TEST NO. TC W/FS-1

ANALYST [illegible]

TRAP NO. 21 TANK NO. 4

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 730 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 731 mm Hg

$P_{T(2)}$ 333 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 444 mm Hg - Final Pressure

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(\overset{731}{\cancel{P_{B(2)}}}) - (\overset{333}{\cancel{P_{T(2)}}})] - [(\overset{733}{\cancel{P_{B(1)}}}) - (\overset{730}{\cancel{P_{T(1)}}})]}{[(76) + 460] \times 0.299}$$

V_S = 2.465 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 75 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(2)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(444) + (731)]}{[(731)-(333)] - [(733)-(730)]} \times (75)$$

$C_{VOC(2)}$ = [illegible] ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.111 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = [illegible] mg Carbon in Tank

TRAP ANALYSIS #21

Collection Vessel No. 3

Volume of Collection Vessel 1.000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 741 mm Hg - Initial Vacuum

$P_{CV(2)}$ 252 mm Hg - Final Pressure

T = 72°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 3510 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (3510) \times \left[(252) + (741)\right]\left[\frac{3.467 \times 10^{-4}\ (1.000)}{(72 + 460)}\right]$$

$M_{n(2)}$ = 2.271 mg

$Mn_T = Mn_{(1)} + Mn_{(2)}$

$Mn_T = (0.275) + (2.271)$

Mn_T = ~~0.2546~~ 2.546 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{SV}} = \frac{(2.546)}{(2.465)} = 1.033$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 29.27

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- [illegible]

CLIENT [illegible]

DATE TRAP ANALYSIS 5/[illegible]/79

PROJECT NO. [illegible]

DATE TANK ANALYSIS 5/6/79

TEST NO. [illegible]

ANALYST M.H.

TRAP NO. [illegible] TANK NO. [illegible]

TANK INITIAL

$P_{B(1)}$ 731 mm Hg

$P_{T(1)}$ 729 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 737 mm Hg

$P_{T(2)}$ 257 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 266 mm Hg - Final Pressure $P_{B(3)}$ 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(737) - (257)] - [(731) - (729)]}{[(76) + 460] \times 0.299}$$

V_S = 2.985 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 132 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(266) + (741)]}{[(737)-(257)] - [(731)-(729)]} \times (132)$$

$C_{VOC(2)}$ = 278 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.139 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.414 mg Carbon in Tank

TRAP ANALYSIS #51

Collection Vessel No. 4

Volume of Collection Vessel 1000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 740 mm Hg - Initial Vacuum

$P_{CV(2)}$ 500 mm Hg - Final Pressure

T = 76°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 6300 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (6300) \times \left[(500) + (740)\right]\left[\frac{3.467 \times 10^{-4}\ (1000)}{(76 + 460)}\right]$$

$M_{n(2)}$ = 5.053 mg

$Mn_T = Mn_{(1)} + Mn_{(2)}$

Mn_T = (0.414) + (5.053)

Mn_T = 5.467 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(5.467)}{(2.983)} = 1.833$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 51.90

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- [illegible]

CLIENT [illegible]

DATE TRAP ANALYSIS 5/4/79

PROJECT NO. [illegible]

DATE TANK ANALYSIS 5/9/79

TEST NO. [illegible]

ANALYST [illegible]

TRAP NO. [illegible] TANK NO. [illegible]

TANK INITIAL

$P_{B(1)}$ 730 mm Hg

$P_{T(1)}$ 729 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 737 mm Hg

$P_{T(2)}$ 312 mm Hg - Post-Test Vacuum

$P_{T(3)}$ [illegible] mm Hg - Final Pressure $P_{B(3)}$ 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(737) - (312)] - [(730) - (729)]}{[(76) + 460] \times 0.299}$$

V_S = 2.646 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 82 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(\text{[illegible]}) + (741)]}{[(737) - (312)] - [(730) - (729)]} \times (82)$$

$C_{VOC(2)}$ = 194 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.097 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.26 mg Carbon in Tank

TRAP ANALYSIS #46

Collection Vessel No. 6

Volume of Collection Vessel 1000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 739 mm Hg - Initial Vacuum

$P_{CV(2)}$ 259 mm Hg - Final Pressure

T = 76°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 8460 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (8460) \times \left[(259) + (739)\right]\left[\frac{3.467 \times 10^{-4}\ (1000)}{(76 + 460)}\right]$$

$M_{n(2)}$ = 5.461 mg

$Mn_T = Mn_{(1)} + Mn_{(2)}$

Mn_T = (.257) + (5.461)

Mn_T = 5.718 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(5.718)}{(2.646)} = 2.161$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 61.20

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- [illegible]

CLIENT [illegible] DATE TRAP ANALYSIS 5/14/79

PROJECT NO. [illegible] DATE TANK ANALYSIS 5/9/79

TEST NO. [illegible] ANALYST [illegible]

TRAP NO. [illegible] TANK NO. [illegible]

TANK INITIAL

$P_{B(1)}$ 737 mm Hg

$P_{T(1)}$ 737 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 736 mm Hg

$P_{T(2)}$ 269 mm Hg - Post-Test Vacuum

$P_{T(3)}$ [illegible] mm Hg - Final Pressure $P_{B(3)}$ - 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(736) - (269)] - [(\cancel{}\ 0)]}{[(76) + 460] \times 0.299}$$

V_S = 2.914 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 135 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(\text{[illegible]}) + (741)]}{[(736) - (269)] - [(737) - (\text{[illegible]})]} \times (135)$$

$C_{VOC(2)}$ = [illegible] ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = [illegible] mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = [illegible] mg Carbon in Tank

TRAP ANALYSIS # 59

Collection Vessel No. 4

Volume of Collection Vessel 1.000 liters - V_{CV}

$P_{B(2)}$ 747 mm Hg

$P_{CV(1)}$ 743 mm Hg - Initial Vacuum

$P_{CV(2)}$ 260 mm Hg - Final Pressure

T = 75°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 3770 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (3770) \times \left[(260) + (743)\right]\left[\frac{3.467 \times 10^{-4}\ (1.000)}{(75 + 460)}\right]$$

$M_{n(2)}$ = 2.450 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (0.418) + (2.450)$$

Mn_T = 2.868 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(2.868)}{(2.914)} = 0.984$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 27.88

TCA SAMPLE ANALYTICAL SHEET

CLIENT [illegible]
PROJECT NO. [illegible]
TEST NO. [illegible]

PCS SAMPLE #79- [illegible]
DATE TRAP ANALYSIS 5/4/79
DATE TANK ANALYSIS 5/8/79
ANALYST [illegible]

TRAP NO. [illegible] TANK NO. [illegible]

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 733 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 736 mm Hg

$P_{T(2)}$ 348 mm Hg - Post-Test Vacuum

$P_{T(3)}$ [illegible] mm Hg - Final Pressure $P_{B(3)}$ 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(736) - (348)] - [(\cancel{\ } \; 0)]}{[(76) + 460] \times 0.299}$$

V_S = 2.421 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 361 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(\text{[illegible]}) + (741)]}{[(736)-(348)] - [(733)-(\text{[illegible]})]} \times (361)$$

$C_{VOC(2)}$ = [illegible] ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = [illegible] mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = [illegible] mg Carbon in Tank

TRAP ANALYSIS #55

Collection Vessel No. 1

Volume of Collection Vessel 0.885 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 728 mm Hg - Initial Vacuum

$P_{CV(2)}$ 250 mm Hg - Final Pressure

T = 76°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 4850 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (4850) \times \left[(250) + (728)\right]\left[\frac{3.467 \times 10^{-4}\ (0.885)}{(76 + 460)}\right]$$

$M_{n(2)}$ = 2.715 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (1.123) + (2.715)$$

Mn_T = 3.838 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(3.838)}{(2.421)} = 1.585$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 44.90

TCA SAMPLE ANALYTICAL SHEET

CLIENT [illegible]
PROJECT NO. [illegible]
TEST NO. 1[illegible] - EFS - 1 11

PCS SAMPLE #79- 776
DATE TRAP ANALYSIS 5/9/79
DATE TANK ANALYSIS 5/9/79
ANALYST [illegible]

TRAP NO. 37[illegible] TANK NO. 22

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 730 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 730 mm Hg

$P_{T(2)}$ 318 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 411 mm Hg - Final Pressure

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(730) - (318)] - [(733) - (730)]}{[(76) + 460] \times 0.299}$$

V_S = 2.552 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 97 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(2)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(411) + (730)]}{[(730)-(318)] - [(733)-(730)]} \times (97)$$

$C_{VOC(2)}$ = 270 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.135 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.345 mg Carbon in Tank

TRAP ANALYSIS #37

Collection Vessel No. 5

Volume of Collection Vessel 1.000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ ~~759~~ 740 mm Hg - Initial Vacuum

$P_{CV(2)}$ ~~750~~ 255 mm Hg - Final Pressure

~~T = 86°F~~
T = 78°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 3670 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (3670) \times \left[(255) + (740)\right]\left[\frac{3.467 \times 10^{-4}\ (1.000)}{(78 + 460)}\right]$$

$M_{n(2)}$ = 2.353 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (0.345) + (2.353)$$

Mn_T = 2.698 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(2.698)}{(2.552)} = 1.057$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 29.94

TCA SAMPLE ANALYTICAL SHEET

CLIENT [illegible]
PROJECT NO. [illegible]
TEST NO. [illegible] - 1B

PCS SAMPLE #79- [illegible]
DATE TRAP ANALYSIS 5/4/79
DATE TANK ANALYSIS 5/2/79
ANALYST [illegible]

TRAP NO. [illegible] TANK NO. [illegible]

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 731 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 730 mm Hg

$P_{T(2)}$ 282 mm Hg - Post-Test Vacuum

$P_{T(3)}$ [illegible] mm Hg - Final Pressure $P_{B(3)}$ 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(730) - (282)] - [(733) - (731)]}{[(76) + 460] \times 0.299}$$

V_S = 2.783 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ [illegible] ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(\text{[illegible]}) + (741)]}{[(730) - (282)] - [(733) - (731)]} \times (\text{[illegible]})$$

$C_{VOC(2)}$ = [illegible] ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = [illegible] mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = [illegible] mg Carbon in Tank

TRAP ANALYSIS #13

Collection Vessel No. 3

Volume of Collection Vessel 1000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 739 mm Hg - Initial Vacuum

$P_{CV(2)}$ 254 mm Hg - Final Pressure

T- 76°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 3920 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (3920) \times \left[(254) + (739)\right]\left[\frac{3.467 \times 10^{-4} (1000)}{(76 + 460)}\right]$$

$M_{n(2)}$ = 2.518 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (0.737) + (2.518)$$

Mn_T = 3.255 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(3.255)}{(2.783)} = 1.170$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 33.12

TCA SAMPLE ANALYTICAL SHEET

CLIENT Monsanto - EPA
PROJECT NO. 118-1
TEST NO. 1C-EFS-2

PCS SAMPLE #79- 778
DATE TRAP ANALYSIS 5/4/79
DATE TANK ANALYSIS 5/7/79
ANALYST [illegible]

TRAP NO. 41 TANK NO. 3

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 730 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 737 mm Hg

$P_{T(2)}$ 318 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 251 mm Hg - Final Pressure $P_{B(3)}$ = 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(737) - (318)] - [(733) - (730)]}{[(76) + 460] \times 0.299}$$

V_S = 2.596 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 35 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(251) + (741)]}{[(737)-(318)] - [(733)-(730)]} \times (35)$$

$C_{VOC(2)}$ = 203 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.101 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.263 mg Carbon in Tank

TRAP ANALYSIS #41

Collection Vessel No. 5

Volume of Collection Vessel 6.000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 740 mm Hg - Initial Vacuum

$P_{CV(2)}$ 288 mm Hg - Final Pressure

T = 75°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 8090 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (8090) \times \left[(288) + (740)\right]\left[\frac{3.467 \times 10^{-4} (6.000)}{(75 + 460)}\right]$$

$M_{n(2)}$ = 5.389 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (0.263) + (5.389)$$

Mn_T = 5.652 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(5.652)}{(2.596)} = 2.177$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 61.66

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- [illegible]

CLIENT [illegible]

DATE TRAP ANALYSIS 5/4/79

PROJECT NO. [illegible]

DATE TANK ANALYSIS 5/6/79

TEST NO. [illegible]

ANALYST [illegible]

TRAP NO. ~~[illegible]~~ 45

TANK NO. 24

TANK INITIAL

$P_{B(1)}$ 737 mm Hg

$P_{T(1)}$ 737 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 736 mm Hg

$P_{T(2)}$ 262 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 251 mm Hg - Final Pressure $P_{B(3)}$ 741 T 77

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(736) - (262)] - [(737) - (737)]}{[(76) + 460] \times 0.299}$$

V_S = 2.958 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 50 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(251) + (741)]}{[(736)-(262)] - [(737)-(737)]} \times (50)$$

$C_{VOC(2)}$ = 105 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.052 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.155 mg Carbon in Tank

TRAP ANALYSIS #54

Collection Vessel No. 4

Volume of Collection Vessel 1000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ 740 mm Hg - Initial Vacuum

$P_{CV(2)}$ 252 mm Hg - Final Pressure

T = 75°F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 5430 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (5430) \times \left[(252) + (740)\right]\left[\frac{3.467 \times 10^{-4}\ (1.000)}{(75 + 460)}\right]$$

$M_{n(2)}$ = 3.491 mg

$Mn_T = Mn_{(1)} + Mn_{(2)}$

$Mn_T = (0.155) + (3.491)$

Mn_T = 3.646 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(3.646)}{(2.953)} = 1.232$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 34.90

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 780

CLIENT Monsanto - EPA

DATE TRAP ANALYSIS 5/4/79

PROJECT NO. 118-1

DATE TANK ANALYSIS 5/7/79

TEST NO. TC-EFS-3B

ANALYST RH

TRAP NO. 44 TANK NO. 19

TANK INITIAL

$P_{B(1)}$ 737 mm Hg

$P_{T(1)}$ 737 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 736 mm Hg

$P_{T(2)}$ 241 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 250 mm Hg -. Final Pressure $P_{B(3)}$ = 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(736) - (241)] - [(737) - (737)]}{[(76) + 460] \times 0.299}$$

V_S = 3.089 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 71 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(2)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(250) + (741)]}{[(736)-(241)] - [(737)-(737)]} \times (71)$$

$C_{VOC(2)}$ = 142 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.071 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.219 mg Carbon in Tank

TRAP ANALYSIS #44

Collection Vessel No. 2

Volume of Collection Vessel 1.000 liters - V_{CV}

$P_{B(2)}$ 745 mm Hg

$P_{CV(1)}$ -739 mm Hg - Initial Vacuum

$P_{CV(2)}$ 294 mm Hg - Final Pressure

T 76 °F

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ 6060 ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (6060) \times \left[(294) + (739)\right]\left[\frac{3.467 \times 10^{-4} (1.000)}{(76 + 460)}\right]$$

$M_{n(2)}$ = 4.049 mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (\cancel{0.294}\ 0.219) + (4.049)$$

Mn_T = 4.268 mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(4.268)}{(3.089)} = 1.382$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= 39.13

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- 781

CLIENT [illegible]

DATE TRAP ANALYSIS

PROJECT NO. [illegible]

DATE TANK ANALYSIS 5/8/79

TEST NO. [illegible]

ANALYST [illegible]

TRAP NO. [illegible] TANK NO. 34

TANK INITIAL

$P_{B(1)}$ 732 mm Hg

$P_{T(1)}$ 729 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ ~~741~~ 730 mm Hg

$P_{T(2)}$ ~~247~~ 241 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 253 mm Hg - Final Pressure ($P_{B(3)}$ = 741)

T ~~75~~ 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(730) - (241)] - [(732) - (729)]}{[(76) + 460] \times 0.299}$$

V_S = 3.032 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 161 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(253) + (741)]}{[(730)-(241)] - [(732)-(729)]} \times (161)$$

$C_{VOC(2)}$ = 329 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.165 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.499 mg Carbon in Tank

TRAP ANALYSIS

Collection Vessel No. _____

Volume of Collection Vessel _____ liters - V_{CV}

$P_{B(2)}$ _____ mm Hg

$P_{CV(1)}$ _____ mm Hg - Initial Vacuum

$P_{CV(2)}$ _____ mm Hg - Final Pressure

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ _____ ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (\qquad) \times \left[(\qquad) + (\qquad)\right]\left[\frac{3.467 \times 10^{-4} (\qquad)}{(\qquad + 460)}\right]$$

$M_{n(2)}$ = _____ mg

$$Mn_T = Mn_{(1)} + Mn_{(2)}$$

$$Mn_T = (0.499) + (\qquad)$$

Mn_T = _____ mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(\qquad)}{(3.032)} = \_\_\_\_\_$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= _____

TCA SAMPLE ANALYTICAL SHEET

PCS SAMPLE #79- [illegible]

CLIENT [illegible] DATE TRAP ANALYSIS

PROJECT NO. 118-1 DATE TANK ANALYSIS 5/9/79

TEST NO. [illegible] ANALYST [illegible]

TRAP NO. -- TANK NO. 39

TANK INITIAL

$P_{B(1)}$ 733 mm Hg

$P_{T(1)}$ 733 mm Hg
Initial Vacuum
(Pre-Test)

TANK FINAL

$P_{B(2)}$ 730 mm Hg

$P_{T(2)}$ 222 mm Hg - Post-Test Vacuum

$P_{T(3)}$ 251 mm Hg - Final Pressure $P_{B(3)}$ 741

T 76 °F

SAMPLE VOLUME

$$V_S = \frac{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]}{(T + 460) \times 0.299}$$

$$V_S = \frac{[(730) - (222)] - [(-7) - (0)]}{[(76) + 460] \times 0.299}$$

V_S = 3.170 sample volume - liters

TANK ANALYSIS

Sample Loop	Backflush Area	Attn.	Std. Area	Attn.	Std.Conc. (ppm)	$C_{VOC(1)}$ Sample Conc. ppm

$C_{VOC(1)}$ 168 ppm as CO_2 - measured

$$C_{VOC(2)} = \frac{[P_{T(3)} + P_{B(3)}]}{[P_{B(2)} - P_{T(2)}] - [P_{B(1)} - P_{T(1)}]} \times C_{VOC(1)}$$

$$C_{VOC(2)} = \frac{[(251) + (741)]}{[(730)-(222)] - [(733)-(733)]} \times (168)$$

$C_{VOC(2)}$ = 328 ppm as CO_2 - sample

MASS OF CARBON IN TANK

$C_{VOC(3)} = C_{VOC(2)} \times 4.996 \times 10^{-4}$ = 0.164 mg/l (68°F, 760 mm Hg)

$M_{n\ VOC(1)} = C_{VOC(3)} \times V_S$ = 0.520 mg Carbon in Tank

TRAP ANALYSIS

Collection Vessel No. _____

Volume of Collection Vessel _____ liters - V_{CV}

$P_{B(2)}$ _____ mm Hg

$P_{CV(1)}$ _____ mm Hg - Initial Vacuum

$P_{CV(2)}$ _____ mm Hg - Final Pressure

MASS OF CARBON COLLECTED

$C_{VOC(4)}$ _____ ppm as CO_2

$$M_{n\ VOC(2)} = C_{VOC(4)} \times \left[P_{CV(2)} + P_{CV(1)}\right] \left[\frac{3.467 \times 10^{-4} \times V_{CV}}{T(°F) + 460}\right]$$

$$M_{n\ VOC(2)} = (\qquad) \times \left[(\qquad) + (\qquad)\right]\left[\frac{3.467 \times 10^{-4}\ (\qquad)}{(\qquad + 460)}\right]$$

$M_{n(2)}$ = _____ mg

$Mn_T = Mn_{(1)} + Mn_{(2)}$

Mn_T = (0.520) + ( )

Mn_T = _____ mg Carbon

$$\text{mg Carbon/liter} = \frac{Mn_T}{V_{sv}} = \frac{(\qquad)}{(3.170)} = \_\_\_\_\_$$

mg Carbon/DSCF = mg Carbon/liter X 28.32

= _____

APPENDIX K

MISCELLANEOUS ANALYTICAL DATA SHEETS

9-04-24-03

ANALYSIS REQUEST

DATE 4/16/79

NO. (By office) 1-79-04-16-01

REQUESTER K. Tackett

CHARGE NO. 101.1062

TO INSTRUMENTAL ANALYSIS

SAMPLE NUMBERS

1-1-1, 1-4-1, 1-8-1, 2-2-1, 2-5-1, 2-9-1, 2-11-1, 1-2-2, 1-6-2, 1-9-2, 2-3-2, 2-6-2, 2-9-2
1-2-1, 1-6-1, 1-9-1, 2-3-1, 2-6-1, 2-9-1, 2-12-1, 1-3-2, 1-7-2, 2-1-2, 2-4-2, 2-7-2, 2-10-2
1-3-1, 1-7-1, 2-1-1, 2-4-1, 2-7-1, 2-10-1, 1-1-2, 1-4-2, 1-8-2, 2-2-2, 2-5-2, 2-8-2, 2-11-2
2-12-2, SR-3
RR-3, SY-3
RY-3, SBU-3
RBA-3, RBV-3, SBA-3

PURPOSE OF ANALYSIS

Solvent species in Ink by GC

SAMPLE HISTORY (Include names and structural formulas of reactants, catalysts, and expected products)

Ink samples from ink wells on color presses.

Samples # a-b-c
a = press #
b = ink well #
c = Day 1, 2 or 3

Ink samples from Ink storage Tanks

Samples # X_1X_2-C
X_1 = Regular or Special
X_2 = Red, Yellow, Blue, or Black
C = Day 1, 2 or 3

PROPERTIES

Unstable ____ Explosive ____, Toxic ____, Stench ____, Sublimes ____, Hygroscopic ____, Use dry box ____

MP ____ BP ____ mm, Solvents ____

Other Dries Quickly

ANALYSES REQUESTED

CHEMICAL				
Analysis	Probable Range	No. of Runs 1	2	*
Toluene (% of solvent)	30-50%			
Xylene (")	~10%			
Naptha (")	30-50%			
Solvent Total (% of Sample)	60-80%			

* Duplicate runs only if first run does not check "Probable Range".

INSTRUMENTAL

Gas Chromatography (circled)
Ultraviolet
Visible
Infrared
Emission
Raman
NMR
EPR
XRD
Atomic Absorption
Mass Spec
Surface Area (BET)
Other

Qualitative ____, Semi-quantitative ____, Quantitative X

REMARKS (Special instructions, etc.)

Shake well before Analysis Results to W.R. Fearheller

URGENT? Yes ____ No ____

APPROVED BY

REFERENCE TO PREVIOUS WORK (Request no., journals, etc.)

SCHEDULING AND ASSIGNMENTS (Analytical services use only)

Analysis	Completion Date	Assigned to	Analysis	Completion Date	Assigned to

ANALYSIS REPORT	DATE May 14, 1974	cc:Files
TO W. Fearheller	RECORD NUMBER Log No 9-04-24-03 CASC 1-79.04-16-01	
FROM ANALYTICAL SERVICES MONSANTO RESEARCH CORPORATION Dayton, Ohio	PROJECT NUMBER 13-022-760-54-101-1062	
	NOTEBOOK REFERENCE 1413943	

Naphtha, Toluene and xylene in water

The samples were run on a Perkin Elmer 3920 G.C. using a 6'x1/4" Glycerol column followed by a 1/8"x 20" 10% FFAP column. The data was taken from curves prepared from external standards of naphtha, toluene and xylene. Each sample was mixed well before it was injected.

A considerable amount of effort was spent trying to find a column system than could handle naphtha, toluene, xylene and water

Sample ID	ppm naphtha	ppm Toluene	ppm xylene
Day 1 Decanter outlet	ND *	151.0	13.0
Day 2 1155 Decanter	ND *	90.0	35.0
Day 3 Decanter	11.0	133.0	43.0

* The lowest limit of detection for naphtha was ~ 8 ppm

ANALYST: Thomas J Manual IDAD

ANALYSIS REPORT

TO: W. Feuerheller

FROM:

ANALYTICAL SERVICES
MONSANTO RESEARCH CORPORATION
Dayton, Ohio

DATE: May 8 1979

RECORD NUMBER: MRC 9-04-24-03
RASC 1-79-04-16-01

PROJECT NUMBER: 13-022-760-54-101-1062

NOTEBOOK REFERENCE: 1413939

cc: Files

Analysis of Naphtha Toluene and Xylene in Printing Ink

The analysis was run on a Perkin Elmer 3920 GC using a 1/8" x 20" 10% FFAP column at 95°C. The samples had to be diluted 1 to 10 with carbon disulfide in order to draw the slurry into the syringe. The percent naptha, toluene and xylene was taken from a curve of external standards. The standards were prepared by mixing the three solvents to the proper percentages of each.

Sample #	Color	% naphtha	% Toluene	% xylene	Total Solv.
1-1-1	yellow	72.5	18.5	3.5	94.5
1-2-1 (1-1-2)	red	62.5	16.2	3.3	[illegible]
1-3-1* (1-1-3)	blue	65.0	16.8	3.3	85.1
1-4-1 (1-1-4)	black	59.2	15.2	3.7	78.1
1-6-1 (1-1-6)	yellow	73.5	18.5	4.0	[illegible]
1-7-1 (1-1-7)	red	65.1	17.6	3.4	[illegible]
1-8-1 (1-1-8)	blue	70.7	17.5	3.5	91.7
1-9-1 (1-1-9)	black	61.8	17.1	3.2	[illegible]
2-1-1	yellow	67.2	16.3	3.7	87.1
2-2-1	red	64.7	19.0	3.6	[illegible]
2-3-1	blue	58.8	13.5	3.2	[illegible]
2-4-1	black	55.7	13.2	3.3	72.2
2-5-1	yellow	64.3	16.3	3.3	[illegible]
2-6-1	red	51.8	12.3	19.3	83.1
2-7-1	blue	56.8	12.7	4.5	[illegible]
2-8-1	black	58.5	13.3	3.4	75.2
2-9-1	yellow	66.2	16.7	3.3	86.2
2-10-1	red	49.5	11.9	16.2	77.6

*Numbers on the bottles and request sheet are not the same

ANALYST: T. Morrow

ANALYSIS REPORT

TO: W. Feuerhelter

FROM: ANALYTICAL SERVICES
MONSANTO RESEARCH CORPORATION
Dayton, Ohio

DATE: May 8 1979

RECORD NUMBER: MRC 9-04-24-03
EASC 1-79-04-16-01

PROJECT NUMBER: 13-022-760-54-101-1062

NOTEBOOK REFERENCE: 141-3939

cc: Files

Sample No	Color	% naptha	% Toluene	% xylene	% Total Solvent
2-11-1	blue	48.5	10.8	9.6	[illegible]
2-12-1	black	54.0	12.1	3.1	[illegible]
1-2-2	yellow	70.7	17.7	3.6	[illegible]
1-2-2	red	65.7	16.8	3.3	[illegible]
1-3-2	blue	67.2	16.8	3.5	[illegible]
1-4-2	black	56.5	15.6	3.7	15.8
1-6-2	yellow	69.0	17.2	3.7	[illegible]
1-7-2	red	65.0	17.7	3.2	[illegible]
1-8-2	blue	63.0	16.0	3.0	[illegible]
1-9-2	black	61.2	17.0	3.7	[illegible]
2-1-2	yellow	64.0	15.0	3.2	[illegible]
2-2-2	red	65.8	15.5	3.4	[illegible]
2-3-2	blue	67.0	16.8	5.7	[illegible]
2-4-2	black	56.0	13.3	3.7	[illegible]
2-5-2	yellow	61.0	15.3	3.3	79.6
2-6-2	red	58.2	14.0	5.5	[illegible]
2-7-2	blue	62.5	14.0	3.7	[illegible]
2-8-2	black	55.6	13.0	3.4	[illegible]
2-9-2	yellow	65.0	16.5	3.2	4.1
2-10-2	red	58.7	14.3	3.8	76.8
2-12-2	black	57.5	12.5	0.6	[illegible]
2-11-2	blue	60.0	13.2	3.3	[illegible]
RBU-3	blue	60.1	14.3	1.0	[illegible]
5BA3	black	58.5	10.3	13.2	[illegible]
RBA-3	black	63.5	20.7	2.0	56.2
Sub 3	blue	60.0	10.2	1.5	71.7
RR-3	red	55.5	13.2	0.7	[illegible]

ANALYST: T. Morrow

ANALYSIS REPORT

TO: W. Feuerhelber	DATE: May 8 1979
	RECORD NUMBER: MRC 9-04-24-03 PASC 1-79-04-16-01
FROM: ANALYTICAL SERVICES, MONSANTO RESEARCH CORPORATION, Dayton, Ohio	PROJECT NUMBER: 13-022-760-54-101-1062
	NOTEBOOK REFERENCE: 1413939

cc:Files

Sample #	Color	% naptha	% Toluene	% Xylene	% TOTAL SOLUBLE
SR-3	red	48.5	10.5	1.5	66.5
SY3	yellow	47.5	12.0	1.6	61.1
RY3	yellow	51.7	12.5	1.6	[illegible]

ANALYST: T. Morrow

ANALYSIS REPORT

TO: G. Ball

FROM: ANALYTICAL SERVICES
MONSANTO RESEARCH CORPORATION
Dayton, Ohio

DATE: Aug 29 1979

RECORD NUMBER: MRC 9-04-24-03
EASC 1-79-04-16-01

PROJECT NUMBER:

NOTEBOOK REFERENCE: 1413966

cc: Files

Naphtha, Toluene and Xylene analysis of Inks

The samples run below are a reanalysis of five of the samples run on May 8, 1979 NBP 1413939. The same sample preparation and G.C. procedures and conditions were used

Sample I.D	Volume % Naphtha	Volume % Toluene	Volume % xylene	
5BA3	53.5	8.0	1.0	
5BU3	28.0	8.5	1.6	
RBU3	64.0	12.7	0.8	
RBA3	57.5	15.0	1.5	
RR-3	64.0	13.0	0.7	

Results of analysis run on May 8 1979

5 BA3	58.5	10.3	13.0	-- should have been 1.3 ←
5 BU3	60.0	10.2	1.5	
R BU3	60.1	14.3	1.0	
R BA3	63.5	20.7	2.1	
R R-3	55.5	13.2	0.7	

ANALYST: [illegible]

TEXAS COLOR PRINTERS, INC.

SOLVENT IN INK SPECIFICATION
(BASED ON SUPPLIER'S DATA)

COLOR	% SOLVENT GROUP I	% SOLVENT GROUP II
YELLOW	66	56
RED	56	58
BLUE	63	54
BLACK	50	54
EXTENDER	69	—

TOTAL SOLVENT IN PRESS
(FROM INK COMPOSITION AND ADDED SOLVENT)

RUN 1

PRESS NO	FOUNTAIN NO	COLOR	GALS USED	% SOLVENT	GALS SOLVENT	
1	1	YELLOW	84	66	55.4	
	2	RED	39	56	21.8	
	3	BLUE	23	63	14.5	
	4	BLACK	21	50	10.5	
	6	YELLOW	57	66	37.6	
	7	RED	40	56	22.4	
	8	BLUE	32	63	20.2	
	9	BLACK	22	50	11.0	
		EXTENDER	18	69	12.4	
		PURE SOLV.	367	100	367	572.8
2.	1	YELLOW	7	56	3.9	
	2	RED	14	58	8.1	
	3	BLUE	22	54	11.9	
	4	BLACK	26	54	14.0	
	5	YELLOW	22	56	12.3	
	6	RED	22	58	12.8	
	7	BLUE	20	54	10.8	
	8	BLACK	14	54	7.6	
	9	YELLOW	33	56	18.5	
	10	RED	20	58	11.6	
	11	BLUE	19	54	10.3	
	12	BLACK	21	54	11.3	
		EXTENDER	12	69	8.3	
		SOLVENT	186	100	186.0	327.4
					TOTAL	900.2

TOTAL SOLVENT IN PRESS
(FROM INK COMPOSITION AND ADDED SOLVENT)

RUN 2

PRESS No	FOUNTAIN No	COLOR	GALS USED	% SOLVENT	GALS SOLVENT	
1	1	YELLOW	48	66	31.7	
	2	RED	35	56	19.6	
	3	BLUE	28	63	17.6	
	4	BLACK	18	50	9.0	
	6	YELLOW	44	66	29.0	
	7	RED	38	56	21.3	
	8	BLUE	44	63	27.7	
	9	BLACK	20	50	10.0	
		EXTENDER	5	69	3.5	
		PURE SOLV.	350	100	350	519.4
2	1	YELLOW	26	56	14.6	
	2	RED	18	58	10.4	
	3	BLUE	26	54	14.0	
	4	BLACK	8	54	4.3	
	5	YELLOW	32	56	17.9	
	6	RED	25	58	14.5	
	7	BLUE	29	54	15.7	
	8	BLACK	20	54	10.8	
	9	YELLOW	42	56	23.5	
	10	RED	26	58	15.1	
	11	BLUE	24	54	13.0	
	12	BLACK	24	54	13.0	
		EXTENDER	19	69	13.1	
		SOLVENT	279	100	279	458.9
					TOTAL	978.3

TOTAL SOLVENT IN PRESS
(FROM INK COMPOSITION AND ADDED SOLVENT)

RUN 3

PRESS No	FOUNTAIN No	COLOR	GALS USED	% SOLVENT	GALS SOLVENT	
1	1	YELLOW	55	66	36.3	
	2	RED	40	56	22.4	
	3	BLUE	50	63	31.5	
	4	BLACK	16	50	8.0	
	6	YELLOW	51	66	33.7	
	7	RED	43	56	24.1	
	8	BLUE	44	63	27.7	
	9	BLACK	21	50	10.5	
		EXTENDER	26	69	17.9	
		PURE SOLV.	423	100	423	635.1
2	1	YELLOW	18	56	10.1	
	2	RED	9	58	5.2	
	3	BLUE	18	54	9.7	
	4	BLACK	12	54	6.5	
	5	YELLOW	27	56	15.1	
	6	RED	14	58	8.1	
	7	BLUE	17	54	9.2	
	8	BLACK	14	54	7.6	
	9	YELLOW	49	56	27.4	
	10	RED	25	58	14.5	
	11	BLUE	18	54	9.7	
	12	BLACK	22	54	11.9	
		EXTENDER	66	69	45.5	
		SOLVENT	262	100	262	442.5
				TOTAL		1077.6