AP42 Section: 11.1

Reference Number: 373

Title: Stack Emission Test, Payne And Dolan, Inc., Control 15 Plant, Saukville, WI,

Environmental Technology and Engineering Corporation, Elm Grove, WI,

August 27, 1997.

Benzene

SOe

15

Sec. 11.1
Ref. 373

Report to

PAYNE & DOLAN, INC.

Waukesha, Wisconsin

for

STACK EMISSION TEST
CONTROL 15 PLANT
WDNR Air Pollution Control Permit No. 91-DAA-204

August 27, 1997

by

ENVIRONMENTAL TECHNOLOGY & ENGINEERING CORPORATION
13000 West Bluemound Road
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ETE

SUMMARY

On August 27, 1997, Environmental Technology & Engineering Corp. personnel performed stack emissions testing at the Payne & Dolan, Inc. Control 15 Plant located in Saukville, Wisconsin. The tests were performed as a provision of Air Pollution Control Permit No. 91-DAA-204 issued by the State of Wisconsin Department of Natural Resources. Tests were performed in order to determine compliance with the applicable particulate emission limitation. Tests were also performed to determine formaldehyde emissions as a BACT provision. Additional tests were performed to determine plant specific emission factors for sulfur dioxide, benzene, and chlorobenzenes. All measured particulate emissions were well below the limits shown in the following table:

TEST NO.	PARTICULATE	FORMALDEHYDE
1	0.002 gr/dscf	0.28 lb/hr
2	0.003	0.97
3	0.002	0.33
AVERAGE	0.002 gr/dscf	0.52 lb/hr
DNR LIMIT	0.039	NA
% OF LIMIT	6.0 %	

The following table summarizes the other test parameter results in terms of the average plant production rate of 358 tons per hour:

TEST NO.	SULFUR DIOXIDE	BENZENE	CHLORO BENZENE	DICHLORO BENZENE	TRICHLORO BENZENE
1	19.40 lb/hr	0.081 lb/hr	<0.006 lb/hr	<0.007 lb/hr	<0.009 lb/hr
2	20.32	0.140	<0.006	<0.008	<0.009
3	20.55	0.184	<0.007	<0.008	<0.010
AVERAGE	20.09 lb/hr	0.135 lb/hr	<0.006 lb/hr	<0.008 lb/hr	<0.009 lb/hr
FACTOR	0.0561 lb/ton	0.0004 lb/ton	<0.00002 lb/ton	<0.00002 lb/ton	<0.00003 lb/ton

1.0 GENERAL

On August 27, 1997, Environmental Technology & Engineering Corp. (ETE) personnel performed stack emissions testing at the Payne & Dolan, Inc. Control 15 plant located in Saukville, Wisconsin. The purpose of the testing was to determine the particulate and formaldehyde emissions from the plant as a condition of Air Pollution Control Permit No. 91-DAA-204 issued by the State of Wisconsin Department of Natural Resources (WDNR). Additional parameters tested at this time were sulfur dioxide, benzene, chlorobenzene, dichlorobenzene, and trichlorobenzene. These parameters were tested to establish plant specific emission factors for use in emission inventories.

Pete Tolsma and John Pacocha of Payne & Dolan were responsible for assuring proper operating conditions throughout the testing. During the test the plant production rate was approximately 358 tons per hour and included approximately 25 % recycled asphalt. The plant was fired with drain oil. A log of plant activity throughout the test was kept and is included in the APPENDIX. All testing was coordinated with John Pacocha. Mike Griffin of the DNR witnessed the field testing, plant operation, and stack opacity. The field tests, corresponding laboratory analysis, and report preparation were performed by ETE personnel; Bill Dick was the test team leader.

The following sections of this report document the activities and results of the test program. The report presents all of the relevant data collected. Discussions on the interpretation of the data are provided where appropriate. The report, therefore, includes much necessary detail. The results, however, have been presented in the SUMMARY section at the beginning of this report for those readers not wishing to be burdened by the details.

2.0 RESULTS

Isokinetic sampling for particulate matter was performed in accordance with the procedures outlined in EPA Method 17. Formaldehyde testing was performed in accordance with Method 0011 (non-isokinetic). Benzene and chlorobenzene sampling was performed on charcoal tubes in accordance with EPA Method 18. Sulfur dioxide samples were collected and analyzed in accordance with EPA Method 6. A brief summary of the methods is included in Section 3.0 of this report.

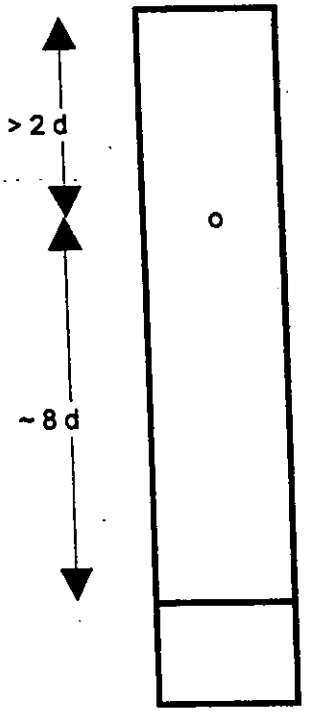
The tests were performed in the final discharge stack at the location shown in Figure 2-1. This same figure also depicts the location of the exact test points relative to the stack wall. Detailed results of the testing to determine particulate matter emissions are shown in Tables 2-1 through 2-3. All results were well below the permit limits. The results are summarized below:

TEST NO.	PARTICULATE
1	0.002 gr/dscf
2	0.003
3	0.002
AVERAGE	0.002 gr/dscf
DNR LIMIT	0.039
% OF LIMIT	6.0 %

PAYNE & DOLAN
CONTROL 15

FIGURE 2-1

SAMPLE PORT LOCATION



SAMPLE POINT LOCATION
DIAMETER 54 in

POINT	DISTANCE
1	2.4
2	7.9
3	16.0
4	38.0
5	46.1
6	51.6

15.90 ft^2

PAYNE & DOLAN | 27-Aug-97 | TABLE 2-1

TEST NO.	1	
BAROMETRIC PRESSURE	29.40	IN HG
TIP DIAMETER	0.250	IN
STACK DIAMETER	54	IN
STACK AREA	15.904	FT3
SAMPLING TIME PER POINT	5	MIN
NUMBER OF POINTS	12	
METER VOLUME	39.58	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.004	
PARTICULATE COLLECTED	0.0063	GRAMS
WATER COLLECTED	389	ML
STATIC PRESSURE	-0.61	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
5.50%	13.50%	0.00%	81.00%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	295	1.05	1.90	80	73.48
2	296	1.10	1.95	81	75.26
3	296	0.95	1.70	82	69.94
4	290	0.72	1.28	83	60.65
5	290	0.70	1.25	85	59.80
6	290	0.70	1.25	88	59.80
7	292	1.00	1.80	91	71.57
8	286	1.05	1.90	92	73.05
9	286	0.94	1.65	94	69.11
10	280	0.75	1.30	95	61.49
11	280	0.72	1.28	98	60.24
12	280	0.70	1.25	100	59.40
AVERAGE	288		1.54	89	66.15

DRY STANDARD VOLUME	39.29	SCF
PERCENT WATER VAPOR	31.79	% VOL
FLOW RATE	63125	ACFM
	29803	DSCFM
	50642	M3/HR
PARTICULATE CONCENTRATION	0.002	GR/DSCF
PARTICULATE EMISSION RATE	0.64	LB/HR
LB PART PER 1000 LB GAS	0.004	
ISOKINETIC PERCENT	102.5	

PAYNE & DOLAN | 27-Aug-97 | TABLE 2-2

TEST NO.	2	
BAROMETRIC PRESSURE	29.40	IN HG
TIP DIAMETER	0.250	IN
STACK DIAMETER	54	IN
STACK AREA	15.904	FT3
SAMPLING TIME PER POINT	5	MIN
NUMBER OF POINTS	12	
METER VOLUME	39.24	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.004	
PARTICULATE COLLECTED	0.0065	GRAMS
WATER COLLECTED	371	ML
STATIC PRESSURE	-0.60	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
5.60%	13.20%	0.00%	81.20%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	255	1.00	1.80	100	69.65
2	262	1.00	1.80	101	69.99
3	275	1.05	1.90	102	72.36
4	277	0.75	1.30	102	61.24
5	278	0.70	1.25	103	59.20
6	278	0.70	1.25	104	59.20
7	280	1.05	1.90	107	72.61
8	282	1.05	1.90	110	72.70
9	282	0.95	1.70	111	69.15
10	280	0.75	1.30	112	61.36
11	281	0.72	1.28	112	60.16
12	280	0.70	1.25	112	59.28
AVERAGE	276		1.55	106	65.58

DRY STANDARD VOLUME	39.03	SCF
PERCENT WATER VAPOR	30.91	% VOL
FLOW RATE	62576	ACFM
	30437	DSCFM
	51719	M3/HR
PARTICULATE CONCENTRATION	0.003	GR/DSCF
PARTICULATE EMISSION RATE	0.67	LB/HR
LB PART PER 1000 LB GAS	0.004	
ISOKINETIC PERCENT	99.7	

PAYNE & DOLAN | 27-Aug-97 | TABLE 2-3

TEST NO.	3	
BAROMETRIC PRESSURE	29.40	IN HG
TIP DIAMETER	0.250	IN
STACK DIAMETER	54	IN
STACK AREA	15.904	FT3
SAMPLING TIME PER POINT	5	MIN
NUMBER OF POINTS	12	
METER VOLUME	39.18	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.004	
PARTICULATE COLLECTED	0.0055	GRAMS
WATER COLLECTED	390	ML
STATIC PRESSURE	-0.62	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
5.60%	13.40%	0.00%	81.00%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	295	1.05	1.90	116	73.51
2	297	1.05	1.90	116	73.60
3	298	0.95	1.70	117	70.06
4	295	0.80	1.45	118	64.16
5	295	0.75	1.30	119	62.12
6	294	0.65	1.15	119	57.80
7	292	1.10	1.95	121	75.09
8	295	1.00	1.80	121	71.73
9	295	0.95	1.70	122	69.92
10	290	0.80	1.45	122	63.95
11	295	0.70	1.25	122	60.02
12	298	0.70	1.25	123	60.14
AVERAGE	295		1.57	120	66.84

DRY STANDARD VOLUME	39.03	SCF
PERCENT WATER VAPOR	31.99	% VOL
FLOW RATE	63783	ACFM
	29768	DSCFM
	50582	M3/HR
PARTICULATE CONCENTRATION	0.002	GR/DSCF
PARTICULATE EMISSION RATE	0.56	LB/HR
LB PART PER 1000 LB GAS	0.003	
ISOKINETIC PERCENT	102.0	

Formaldehyde results are included as Table 2-4.

TABLE 2-4

TEST NO.	FORMALDEHYDE
1	0.28 lb/hr
2	0.97
3	0.33
AVERAGE	0.52 lb/hr
FACTOR	NA

Sulfur dioxide results are included as Table 2-5.

TABLE 2-5

TEST NO.	SULFUR DIOXIDE
1	19.40 lb/hr
2	20.32
3	20.55
AVERAGE	20.09 lb/hr
FACTOR	0.0561 lb/ton

TABLE 2-4

PAYNE & DOLAN
CONTROL 15 PLANT
FORMALDEHYDE RESULTS

Sample No.	Meter Vol. ft3	Meter Temp deg F	Standard Vol liters	Form Captured ug	Form Conc mg/m3	Flow Rate m3/hr	Form ER lb/hr	Production Rate TPH	Emission Factor lb/ton
C15-1	3.00	81	86.69	215.62	2.49	50642	0.28	358	0.0008
C15-2	2.00	80	57.90	491.59	8.49	51719	0.97	357	0.0027
C15-3	2.00	88	57.06	167.82	2.94	50582	0.33	358	0.0009
		AVERAGE			4.64		0.52		0.0015

Meter Gama 1.064
Bar.Pressure 29.40

Calculations

Standard Volume = Meter Vol * Meter Gama*Bar.Pressure*28.32*528/(29.92*(460+Meter Temp))

Concentration = ug/liters = mg/m3

Emission Rate = mg/m3 * m3/hr/453600

Benzene and chlorobenzene results are included in Table 2-6.

TABLE 2-6

TEST NO.	BENZENE	CHLORO BENZENE	DICHLORO BENZENE	TRICHLORO BENZENE
1	0.081 lb/hr	<0.006 lb/hr	<0.007 lb/hr	<0.009 lb/hr
2	0.140	<0.006	<0.008	<0.009
3	0.184	<0.007	<0.008	<0.010
AVERAGE	0.135 lb/hr	<0.006 lb/hr	<0.008 lb/hr	<0.009 lb/hr
FACTOR	0.0004 lb/ton	<0.00002 lb/ton	<0.00002 lb/ton	<0.00003 lb/ton

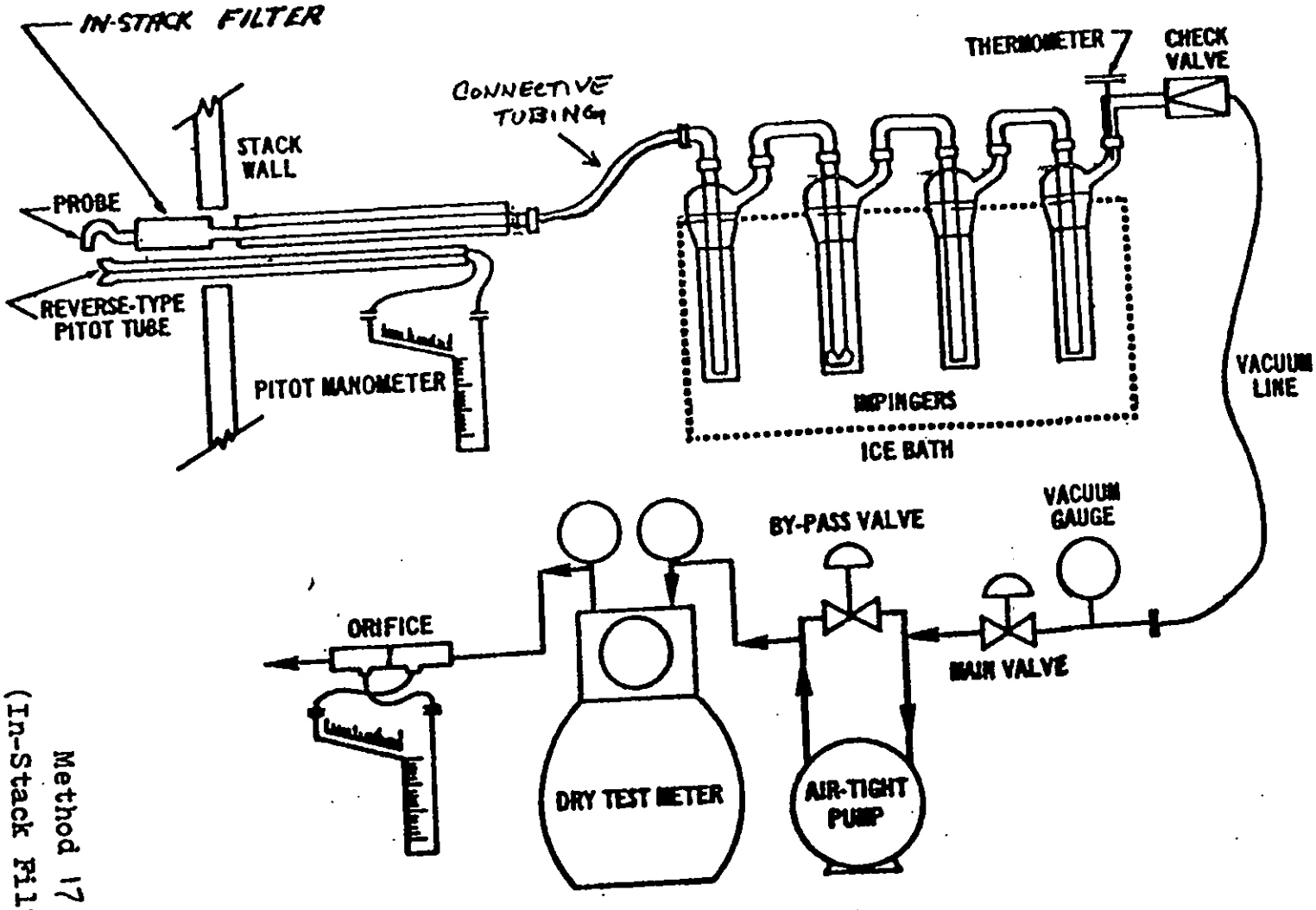
3.0 METHODS

3.1 Particulate

The equipment used to sample was the Western Precipitation Division of the Joy Manufacturing Company Emission Parameter Analyzer. Samples were collected in accordance with EPA Method 17.

The sampling train consisted of a probe tip, an in-stack thimble holder with tared thimble, and a tared back up filter. A series of four impingers followed in an ice bath. The first was a modified Greenburg-Smith impinger with 100 ml of distilled water; the second was a Greenburg-Smith impinger with 100 ml of the same solution; the third was a modified Greenburg Smith impinger dry; and the fourth was also a modified Greenburg-Smith impinger containing a tared quantity of Silica Gel. The gas then passed through a vacuum pump, calibrated dry gas meter, and a calibrated orifice. A schematic drawing of the sampling train is included.

The temperatures of the stack gas stream, as well as strategic locations within the sampling devices, were monitored by RTDs and read directly from a gauge on the control unit.



Particulate sampling train.

Method 17
(In-Stack Filter)

The initial gas stream velocity was obtained from a preliminary traverse using an "S" type pitot tube. The initial moisture was estimated from previous tests of similar processes. This data, along with the stack temperature, was used to set a nomograph so that rapid calculations of isokinetic sampling conditions could be made.

The principle of the method was to collect the sample representative of the exhaust by adjusting the sample collection velocity to match the exhaust gas stream velocity at the point of collection. The velocity at the point of collection was measured with an "S" type pitot tube attached to the probe and the collection velocity was matched to the stack gas velocity by adjusting the flow as indicated by the calibrated orifice.

At the completion of the test, the impinger contents were measured and weighed for determination of the actual moisture content of the exhaust gas stream. The probe tip was washed and brushed with acetone and placed in a tared beaker and evaporated at room temperature. The thimble and beaker were then desiccated to the tared humidity conditions and weighed for the determination of total particulate.

A computer was used to calculate the stack velocities, emission concentrations, emission rates and volumetric flow rates using the field and laboratory data.

3.2 Benzene and Chlorobenzenes

Sampling for these specific organic compounds was performed in accordance with EPA Method 18 - "Measurement of Gaseous Organic Compound Emissions by Gas Chromatography." Samples were drawn from the exhaust gas stream onto solid sorbent tubes (charcoal) using an SKC pump with a stroke counter to measure the sample volume. A minimum of two tubes were placed in series. At the completion of the tests the tubes were desorbed and analyzed by a gas chromatograph equipped with a flame ionization detector. Standard concentrations of compounds were prepared by injecting a known quantity into a tube and then desorbing and analyzing the tube in the same manner as the samples.

The concentrations of the exhaust gas stream were then determined by comparing the response of the standards to the response to the exhaust stack samples. Sample retention times and peak areas were used to quantify the compound emissions. The compound concentrations were then used in conjunction with the exhaust gas flow rates to determine organic compound emission rates in units of pounds per hour (lb/hr).

3.3 Sulfur Dioxide

Samples were collected and analyzed in accordance with the procedures outlined in EPA Method 6 (40 FR, Part 60, Appendix A). The sampling train consisted of a stainless steel probe with a glass wool plug serving as a filter. A series of four midget impingers followed in an ice bath. The first impinger contained 15 milliliters (ml) of 80% isopropyl alcohol, the second and third each contained 15 ml of 3% hydrogen peroxide, and the fourth was dry to serve as a trap for carry-over of any liquid. This train separates out sulfuric acid and sulfur trioxide in the first impinger and sulfur dioxide is collected in the second and third impingers. The gas then passed through a water trap and silica gel tube to trap all water vapor prior to the sampling pump and dry gas meter. A schematic of the sampling train is included as Figure 3-2.

The principle of the method was to collect a representative sample of the exhaust gas stream by placing the probe at a single point in the duct and sampling for a 20 minute period at a nominal sampling rate of 1 liter per minute. At the completion of each test, a leak check was performed and ambient air was purged through the sampling train for approximately 15 minutes.

The first impinger contents were then discarded while the second and third impinger contents were combined along with the washings from the connected tubing. Aliquots of this solution were diluted with known quantities of isopropyl alcohol and titrated with barium perchlorate using thorin indicator. From the quantity of titrant required, the weight of sulfur dioxide was calculated. This information was combined with the volume of gas sampled to determine the sulfur dioxide concentration. The emission rates were then calculated using these concentrations and the volumetric flow rate.

SO2 EMISSIONS CALCULATIONS

P&D Control 15

Sulfur in Burner Fuel

S = 0.63% by weight

Mass of Oil

Mass of one gallon oil = mass of water x specific gravity of oil
Mass = 8.34 lb/gallon x 0..8905 = 7.4268 lb/gallon

Mass Flow of Sulfur Dioxide from the Burner

8 gallons/minute x 60 minutes/hour x 7.4268 lbs/gallon x 0.63/100 sulfur/oil x 2 SO2/S =
44.92 lbs SO2/hour

Mass Flow of Sulfur Dioxide from the Plant Stack

20.55 lbs/hour

Sulfur Dioxide Capture Efficiency

EF = 100 x (Burner SO2 - Stack SO2) / Burner SO2

EF = **54.25** %

comp\plt\so2test.wk1

Oil Services, Inc.

Quality Used Oil Recyclers

P:D 15:
8-27-97

As a used oil marketer, Oil Services, Inc. is subject to EPA regulations 40 CFR Part 266 and Vo. 50, No. 230. In this respect, I am pleased to submit the following data regarding the used oil fuel that you are receiving: Milwaukee, WI Group 2

Constituent/ Property	EPA Specification Used Oil	Your Requirements	Oil Services Used Oil Analysis Report # 7 Blend
Arsenic	5 ppm Max.	5 ppm Max.	0 ppm
Cadmium	2 ppm Max.	2 ppm Max.	1.0 ppm
Chromium	10 ppm Max.	10 ppm Max.	2.1 ppm
Lead	100 ppm Max.	400 ppm Max.	84.7 ppm
Flashpoint	100°F. Min. *1	140 °F. Min.	187 °F.
Total Halogens	4,000 ppm Max. *2	1,500 *2 ppm Max.	1607 ppm
Sulphur % by Wt.	N/A	.9 Specified	0.63
Ash % by Wt.	N/A	1.0 Specified	0.78
B.T.U./gal.	N/A	≥130m Specified	140,000
Acidity	N/A	Neutral Specified	Neutral
Specific Gravity	N/A	.9-.3 Specified	.8705 / API 27.4
PCB's	Varied	0 ppm	0 ppm

*1 - Individual states may require a higher flashpoint, further reducing the possibility of solvent and/or cleaning solution contamination.

*2 - Used oil containing more than 1,000 ppm of total Halogens is presumed hazardous, unless a rebuttle analysis is performed to prove there are no hazardous constituents per EPA regulation 40 CFR Part 266.40 (e), and Subpart D.

Finally, this letter is to assure you that Oil Services, Inc. will be complying with all EPA and individual state requirements, and if I can be of any further assistance, please feel free to contact me at (414) 658-4010

Sincerely,

David E. Jensen
Quality/Compliance Control Manager
Oil Services, Inc.

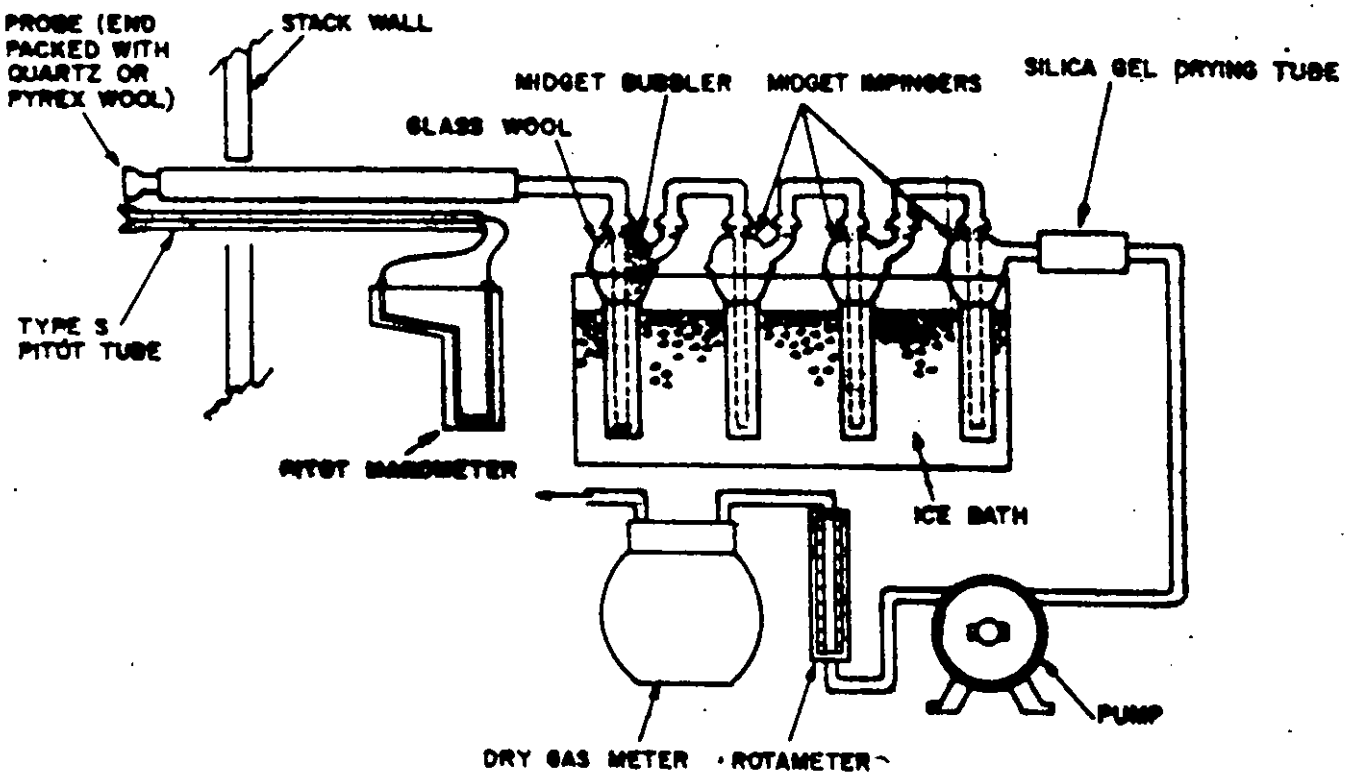


FIGURE - 1 SO_2 SAMPLING TRAIN

3.4 Formaldehyde

The sampling and analysis were performed using procedures outlined in EPA Method 0011, the method required by the Wisconsin Department of Natural Resources for determining formaldehyde emissions.

Sampling was performed by drawing a known quantity of stack exhaust through appropriate sampling media by means of a battery operated pump. The media consisted of a train of three midget impingers; the first two contained 10 ml of a DNPH solution and were followed by an empty impinger and a water trap. The impingers were set in an ice water bath to accommodate the temperature of the gas stream sampled. The sampling volumes were determined through the use of a calibrated dry gas meter.

Following the sampling, the samples were sealed and returned to the lab for analysis. The samples were analyzed via HPLC methods as described by the EPA. A blank was handled in the field in a method identical to the samples and also submitted for analysis

4.0 CALIBRATIONS

4.1 Particulate

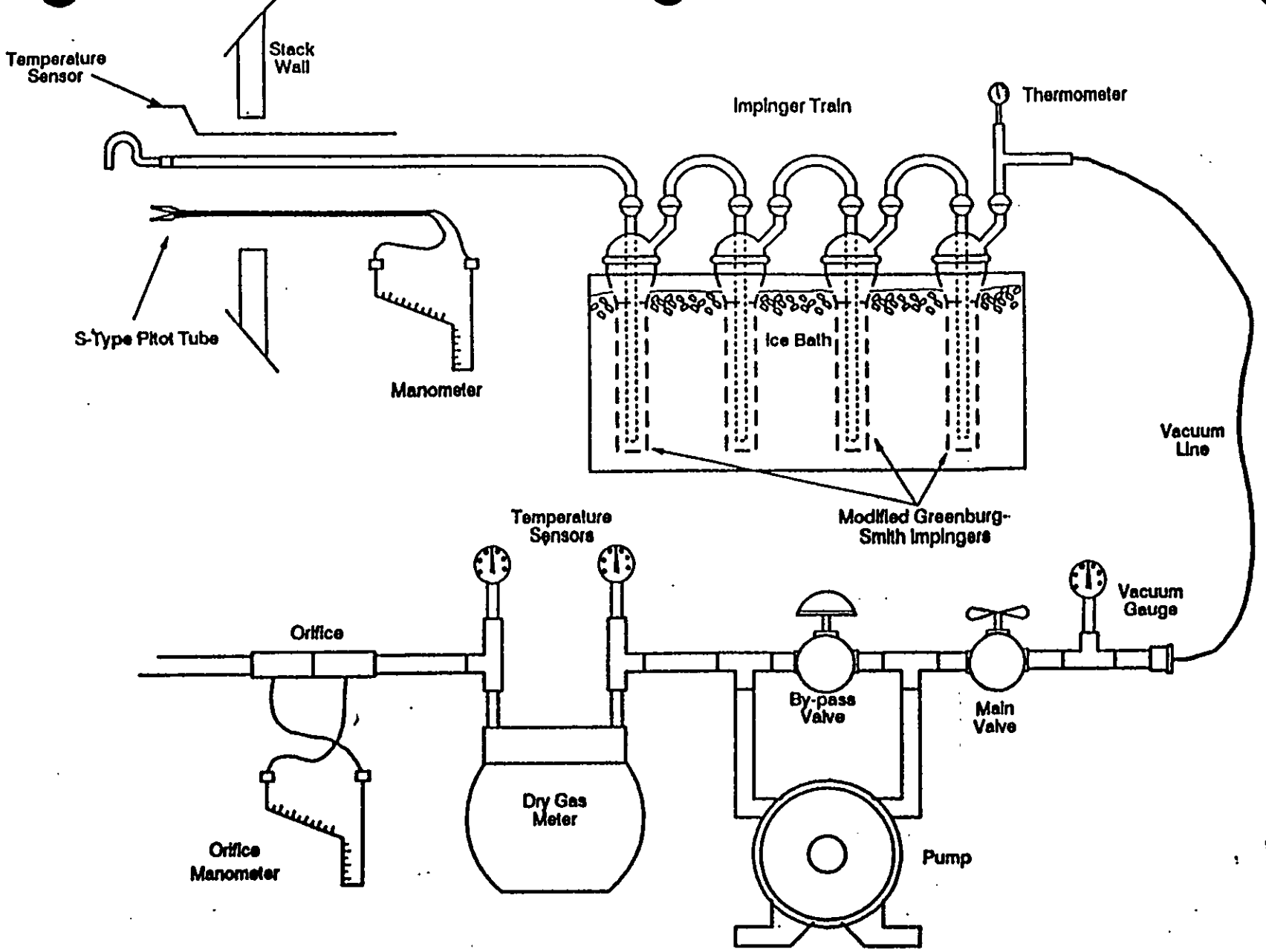
The probe tips, pitot tubes, dry gas meters, and orifices were calibrated prior to the test according to standard procedures as to procedures published by the EPA. The values obtained were:

Probe tip diameter	0.250"
Pitot tube coeff.	0.84
Orifice coeff.	1.814
Dry Gas Meter	1.004

4.2 VOC

An SKC pump was used for VOC sampling were calibrated with a wet test meter through sampling apparatus prior to and following the tests. The value obtained was:

SKC 4	0.456 cc/count



Formaldehyde Sampling Train

4.3 Sulfur Dioxide

A dry gas meter was used to determine the sample volume obtained in the SO2 tests. This dry gas meter was calibrated with a wet test meter. The value obtained was:

Dry Gas Meter	1.027

4.4 Formaldehyde

A dry gas meter was used to determine the sample volume obtained in the formaldehyde tests. This dry gas meter was calibrated with a wet test meter. The value obtained was:

Dry Gas Meter	1.064