

AP42 Section: 11.1

Reference Number: 370

**Title: Carbon Monoxide Stack Emission Test, Payne
And Dolan, Inc., Control 2 Plant, Waukesha, WI,**

**Environmental Technology and Engineering
Corporation, Elm Grove, WI,**

June 19, 1998.

Sec. 11.1
Ref. 370

Report to

PAYNE & DOLAN, INC.

Waukesha, Wisconsin

for

**CARBON MONOXIDE STACK EMISSION TEST
CONTROL 2 PLANT
WDNR FID 268012910**

June 19, 1998

by

ENVIRONMENTAL TECHNOLOGY & ENGINEERING CORPORATION

13000 West Bluemound Road

Elm Grove, Wisconsin 53122

Phone 414-784-2434

Fax 414-784-2436

ETE

SUMMARY

On June 19, 1998, Environmental Technology & Engineering Corp. personnel performed stack emissions testing at the Payne & Dolan, Inc. Control 2 stationary asphalt plant located in Waukesha, Wisconsin. The tests were performed in order to establish carbon monoxide (CO) emission factors for specific types of asphalt plants. This plant is a batch plant fired with natural gas. The test results are summarized in the following table:

TEST NO.	CARBON MONOXIDE
1	0.05 lb/ton
2	0.02
3	0.04
AVERAGE	0.04 lb/ton

1.0 GENERAL

On June 19, 1998, Environmental Technology & Engineering Corp. (ETE) personnel performed stack emissions testing at the Payne & Dolan, Inc. Control 2 stationary asphalt plant located in Waukesha, Wisconsin. The purpose of the testing was to determine the carbon monoxide (CO) emissions from the plant as a part of a study to establish emission factors for various types of asphalt plants fired with different types of fuel.

Chris Lozarski and Pete Tolsma of Payne & Dolan were responsible for assuring proper operating conditions throughout the testing. During the test the plant production rate was approximately 350 tons per hour and included approximately 15 % recycled asphalt. The plant was fired with natural gas. A log of plant activity throughout the test was kept and is included in the APPENDIX. All testing was coordinated with Chris Lozarski at the plant control room. Ryan Bergh of the WDNR was notified of the tests and witnessed the field testing and plant operation. 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

Sampling for carbon monoxide (CO) was performed in accordance with the procedures outlined in EPA Method 10. Flow rate and velocity were determined using EPA Methods 1 through 4. 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 velocity test points relative to the stack wall. Detailed results of the testing to determine CO 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.	CARBON MONOXIDE
1	0.05 lb/ton
2	0.02
3	0.04
AVERAGE	0.04 lb/ton

**PAYNE & DOLAN CONTROL 2
FIGURE 2-1**

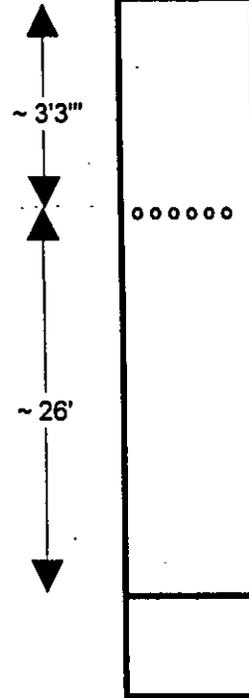
SAMPLE POINT LOCATION

Point	Distance in
1	5.5
2	16.5
3	27.5
4	38.5

TEST PORT LOCATION

**L
W**

**66
44**



CARBON MONOXIDE EMISSION TEST

METHOD 10

TABLE 2-1

**LOCATION
DESCRIPTION
DATE
TEST**

**PAYNE & DOLAN
CONTROL 2 PLANT
19-Jun-98
1**

DIMENSIONS

66 44

**STACK AREA
STACK TEMPERATURE
PITOT COEFFICIENT
PERCENT WATER**

20.17
252
0.84
19.63

**BAR PRESSURE IN HG
STATIC PRESSURE IN H2O
STACK PRESSURE IN HG
CARBON MONOXIDE PPM
PRODUCTION RATE TPH**

29.15
-0.4
29.12
135
350

ORSAT CONSTITUENTS

**O2 14.4
CO2 4.0
CO 0.0
N2 81.6**

**MOLECULAR WEIGHT DRY
MOLECULAR WEIGHT WET
NUMBER OF POINTS**

29.22
27.01
24

POINT

DELTA P

VELOCITY

1	0.42	44.28
2	0.43	44.80
3	0.45	45.83
4	0.40	43.21
5	0.46	46.34
6	0.43	44.80
7	0.56	51.12
8	0.50	48.31
9	0.38	42.11
10	0.42	44.28
11	0.46	46.34
12	0.48	46.34
13	0.40	43.21
14	0.43	44.80
15	0.50	48.31
16	0.42	44.28
17	0.38	42.11
18	0.56	51.12
19	0.50	48.31
20	0.52	49.27
21	0.42	44.28
22	0.42	44.28
23	0.56	51.12
24	0.60	52.92

AVERAGE VELOCITY, AFPS

46.32

FLOW RATE

**ACFM 56050
DSCFM 32514
M3/HR 55247**

CARBON MONOXIDE EMISSIONS

**LB/HR 19.07
LB/TON 0.05**

CARBON MONOXIDE EMISSION TEST

METHOD 10

TABLE 2-2

**LOCATION
DESCRIPTION
DATE
TEST**

**PAYNE & DOLAN
CONTROL 2 PLANT
19-Jun-98
2**

DIMENSIONS		66	44
STACK AREA		20.17	
STACK TEMPERATURE		284	
PITOT COEFFICIENT		0.84	
PERCENT WATER		18.93	

BAR PRESSURE	IN HG	29.15
STATIC PRESSURE	IN H2O	-0.4
STACK PRESSURE	IN HG	29.12
CARBON MONOXIDE	PPM	52
PRODUCTION RATE	TPH	350
ORSAT CONSTITUENTS		
O2		15.0
CO2		3.6
CO		0.0
N2		81.4

MOLECULAR WEIGHT DRY	29.18
MOLECULAR WEIGHT WET	27.06
NUMBER OF POINTS	24

POINT	DELTA P	VELOCITY
1	0.60	54.05
2	0.56	52.22
3	0.52	50.32
4	0.38	43.01
5	0.50	49.34
6	0.47	47.84
7	0.47	47.84
8	0.52	50.32
9	0.38	43.01
10	0.44	46.29
11	0.49	48.84
12	0.44	46.29
13	0.38	43.01
14	0.44	46.29
15	0.51	49.83
16	0.52	50.32
17	0.48	48.34
18	0.45	46.81
19	0.62	54.94
20	0.64	55.82
21	0.36	41.87
22	0.43	45.76
23	0.54	51.28
24	0.58	53.14

AVERAGE VELOCITY, AFPS 48.61

FLOW RATE

ACFM	58824
DSCFM	32939
M3/HR	55970

CARBON MONOXIDE EMISSIONS	LB/HR	7.44
	LB/TON	0.02

3.0 METHODS

Sampling for carbon monoxide was performed in accordance with the procedures outlined in EPA Method 10 - "Determination of Carbon Monoxide Emissions from Stationary Sources" - as published in the Federal Register. Time integrated bag samples were extracted from the exhaust gas stream and analyzed for carbon monoxide concentration using a Horiba nondispersive infrared analyzer (NDIR). The analyzer was calibrated with span gas and zero gas prior to and following each hour of testing. The calibration gas was introduced into a Tedlar bag through the sampling apparatus, similar to the exhaust gas sampled. The calibration span gases for the analyzer were 601, 217, and 45 ppm CO in nitrogen.

Carbon monoxide calculations:

$$\text{CO (mg/m}^3\text{)} = \text{CO (ppm)} * 28 \text{ (molecular weight)}/24.05 \text{ (liters/mole)}$$

$$\text{CO (lb/hr)} = \text{CO (mg/m}^3\text{)} * \text{Flow Rate (m}^3\text{/hr)}/453600 \text{ (mg/lb)}$$

4.0 CALIBRATIONS

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

Pitot tube coeff.	0.84
Dry Gas Meter	1.028
Low Calibration Gas	45 ppm CO
Mid Calibration Gas	201 ppm CO
High Calibration Gas	601 ppm CO

APPENDIX A

Field and Laboratory Data

FIELD SAMPLING DATA

Facility Payne + Dolan Contact Peter Touma
 Address _____ Test Date 6-19-98
 Witnesses _____

Process Description Control 2

Stack Number _____ Analyte H₂O & CO Pump # _____

SAMPLING DATA

Sample ID	Time	Meter Rdg/ Rotameter	Flow Rate	Gain Minutes	Volume	<u>CO</u>
<u>C2-1</u>	<u>0815</u>	<u>426.51/76</u>	---	<u>45.5-20</u>	<u>25.5</u>	<u>130 ppm</u>
	<u>0915</u>	<u>431.51/02</u>	---	<u>11.7-2</u>	---	
	---	<u>5.00/79</u>	---	---	---	
<u>C2-2</u>	<u>0915</u>	<u>431.51/02</u>	---	<u>44.1-20</u>	<u>21.1</u>	<u>52 ppm</u>
	<u>1016</u>	<u>436.51/08</u>	---	---	---	
	---	<u>5.00/85</u>	---	---	---	
<u>C2-1</u>	<u>1017</u>	<u>436.51/08</u>	---	<u>45.0-20</u>	<u>25.0</u>	<u>98 ppm</u>
	---	<u>441.76/90</u>	---	---	---	
	---	<u>5.30/80</u>	---	---	---	

FLOW DATA

	Point	Run 1		Run 2		Run 3	
		Del P					
Diam =	1	42	70	60	38	44	38
L x W = <u>66 x 44</u>	2	43	143	56	44	48	44
Cp = <u>0.84</u>	3	41	50	52	51	44	60
Est Moist	4	40	42	39	52	38	64
	5	46	58	50	48	54	39
	6	43	54	47	45	54	47
	7	50	50	47	62	48	63
	8	50	52	52	64	49	62
	9	39	42	39	36	48	33
	10	42	42	44	43	54	43
	11	46	56	49	54	52	56
	12	46	40	44	50	46	58

	Ps	T	CO2	O2	N2
Run 1	---	<u>253</u>	<u>9.9</u>	<u>18.4</u>	<u>81.6</u>
Run 2	---	<u>284</u>	<u>3.6</u>	<u>15.0</u>	<u>81.4</u>
Run 3	---	<u>286</u>	<u>3.2</u>	<u>15.8</u>	<u>81.0</u>

COMMENTS _____

PAYNE & DOLAN
19-Jun-98
METHOD 4 RESULTS

Sample No.	Meter Vol. ft3	Meter Temp deg F	Standard Vol FT3	Water Captured ml	Water Volume ft3	Total Volume ft3	Percent Water % Vol
H2O-1	5.00	79	4.91	25.5	1.20	6.10	19.63
H2O-2	5.00	85	4.85	24.1	1.13	5.98	18.93
H2O-3	5.20	87	5.03	25.0	1.18	6.20	18.95
							19.17
Meter Gama	1.028						
Bar.Pressure	29.15						

Calculations

$$\text{Standard Volume} = \text{Meter Vol} * \text{Meter Gama} * \text{Bar.Pressure} * 528 / (29.92 * (460 + \text{Meter Temp}))$$

$$\text{Water Volume} = .047 * \text{Water Captured}$$

$$\text{Total Volume} = \text{Water Volume} + \text{Standard Volume}$$

$$\text{Percent Water} = \text{Water Volume} / \text{Total Volume}$$

ASPHALT PLANT STACK TEST DATA

Plant Name: Control #2

Date: 6/18/98
 FID # 267012910

Time*	Burner Setting	PSI Fuel Pressure	Production TPH	Aggregate TPH	% Moisture in Aggregate	RAP TPH	Mix Temp	Stack Temp	Photo-helic	Magne-helic	Fuel Flow Rate	CO ppm	CO2 ppm	O2 %
820	55%		350	300	5%	50	325	330	.20	3.8				
835	48%		350	300		45	323	325	.18	4				
850	49%		350	300	5%	50	320	320	.18	4				
905	55%		350	300		50	319	315	.18	3.8				
920	52%		350	300		50	325	320	.18	3.8				
930	47%		350	300	5%	50	321	300	.18	3.8				
945	49%		350	300		50	320	320	.16	3.7				
000	49%		350	300		50	318	320	.18	3.8				
015	51%		350	300		50	321	322	.15	4.0				
030	50%		350	300	5%	50	320	325	.15	4.0				
045	49%		350	300		50	325	320	.15	4.0				
100	51%		350	300		50	325	315	.15	4.1				
115	46%		350	300	5%	50	330	300	.20	3.8				
130														

Fuel Type Merivel 60's Sulfur in Fuel N/A %
 Plant Drum Type Batch
 * Record data in 15-minute intervals during stack test runs.
 8330 cu. ft. N.G. / hour