EMISSION PERFORMANCE TESTING OF FRYER #5

SITE: EAGLE SNACKS, INC.
Visalia, California

DATE: FEBRUARY 4–5, 1992

Prepared For:

EAGLE SNACKS, INC.
2000 North Road 80
Visalia, California 93291

Contact: Don De Hart
(314) 577–4158

Prepared By:

THOMAS ROONEY
(310) 540–4676

WESTERN ENVIRONMENTAL SERVICES
1010 South Pacific Coast Highway
Redondo Beach, California 90277

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1.0 INTRODUCTION

At the request of Anheuser Busch Companies, Inc., St Louis, Missouri, Western Environmental Services (WES) conducted a compliance test at Eagle Snacks, Visalia, California. The testing consisted of collecting and analyzing particulate samples from kettle fryer #5. The testing was performed from February 4 and 5, 1992 to provide compliance test data for Tulare County Air Pollution Control District.

Triplicate particulate tests were performed at the stack exhaust from kettle fryer #5. The particulate tests were conducted by using EPA Method 5.1.

These units produce potato chips for human consumption. Kettle Fryer #5 operates with a manual frying system.

The following sections will be presented in this report: Summary of Results, Site Description, Sampling and Analytical Procedures, Quality Assurance, and Appendices. The appendices contain the Field and Laboratory data sheets, Gas Calibration Information, Sample Calculations, and Process Data.

2.0 SUMMARY OF RESULTS

2.1 Discussion of Results

Tables 2.1 and 2.2 show the test results. Table 2.1 presents the particulate sampling results from Kettle Fryer #5 while Table 2.2 shows the particulate analytical results.

The results are summarized below.

Test #	Process Input #/Hr	Particulates Concentration Grs/SDCF	Particulates Emission Rate #/Hr
Kettle #5			
1	472	0.0012	0.123
2	554	0.0036	0.352
3	554	0.0027	0.265
Average	527	0.0025	0.247

2.2 Quality Assurance

The particulate sampling train was checked for leaks prior to and after each test. The sampling equipment was calibrated according to the Quality Assurance Handbook for Air Pollution Measurement Systems.

TABLE 2.1 PARTICULATE SAMPLING

SITE: EAGLE SNACKS
UNIT: Fryer #5
DATE: February 4–5, 1992

STACK PARAMETERS	TEST 1	TEST 2	TEST 3	AVERAGE
Barometric Pressure "Hg	29.95	29.95	29.95	29.95
Static Pressure "H20	–0.16	–0.16	–0.16	–0.16
CO2 %	0	0	0	0.00
O2 %	20.94	20.94	20.94	20.94
N2 %	79.06	79.06	79.06	79.06
CO ppm	0	0	0	0
Stack Area FT^2	4.71	4.71	4.71	4.71
Stack Temperature F	74	68	69	70
Stack Pressure "Hg	29.94	29.94	29.94	29.94
TEST CONDITIONS	**TEST 1**	**TEST 2**	**TEST 3**	**AVERAGE**
Sample Volume Ft3	116.515	108.188	111.760	112.154
Meter F	91	57	80	76
Nozzle Dia "	0.22	0.22	0.22	0.22
Time Min	180	180	180	180
Points	24	24	24	24
Pitot Tube Factor cp	0.89	0.89	0.89	0.89
Orfice Press "H2O	1.57	1.39	1.44	1.47
Condensate mls	37	37	40	38
Velocity Pressure "H2O	0.509	0.474	0.472	0.485
Meter Calibration	1.037	1.037	1.037	1.037
TEST CALCULATIONS	**TEST 1**	**TEST 2**	**TEST 3**	**AVERAGE**
Water Vapor SDCF	1.742	1.742	1.883	1.79
Gas Sampled SDCF	116.299	115.038	113.789	115.04
Moisture %	1.48	1.49	1.63	1.53
Molecular Weight Dry	28.84	28.84	28.84	28.84
Molecular Weight Wet	28.68	28.68	28.66	28.67
Gas Velocity Ft/Sec	42.81	41.08	41.04	41.64
Flow Rate ACFM	12098	11609	11599	11769
Flow Rate DSCFM	11793	11443	11395	11544
Isokinetics %	97.81	99.71	99.04	98.85

TABLE 2.2 PARTICULATE ANALYSIS

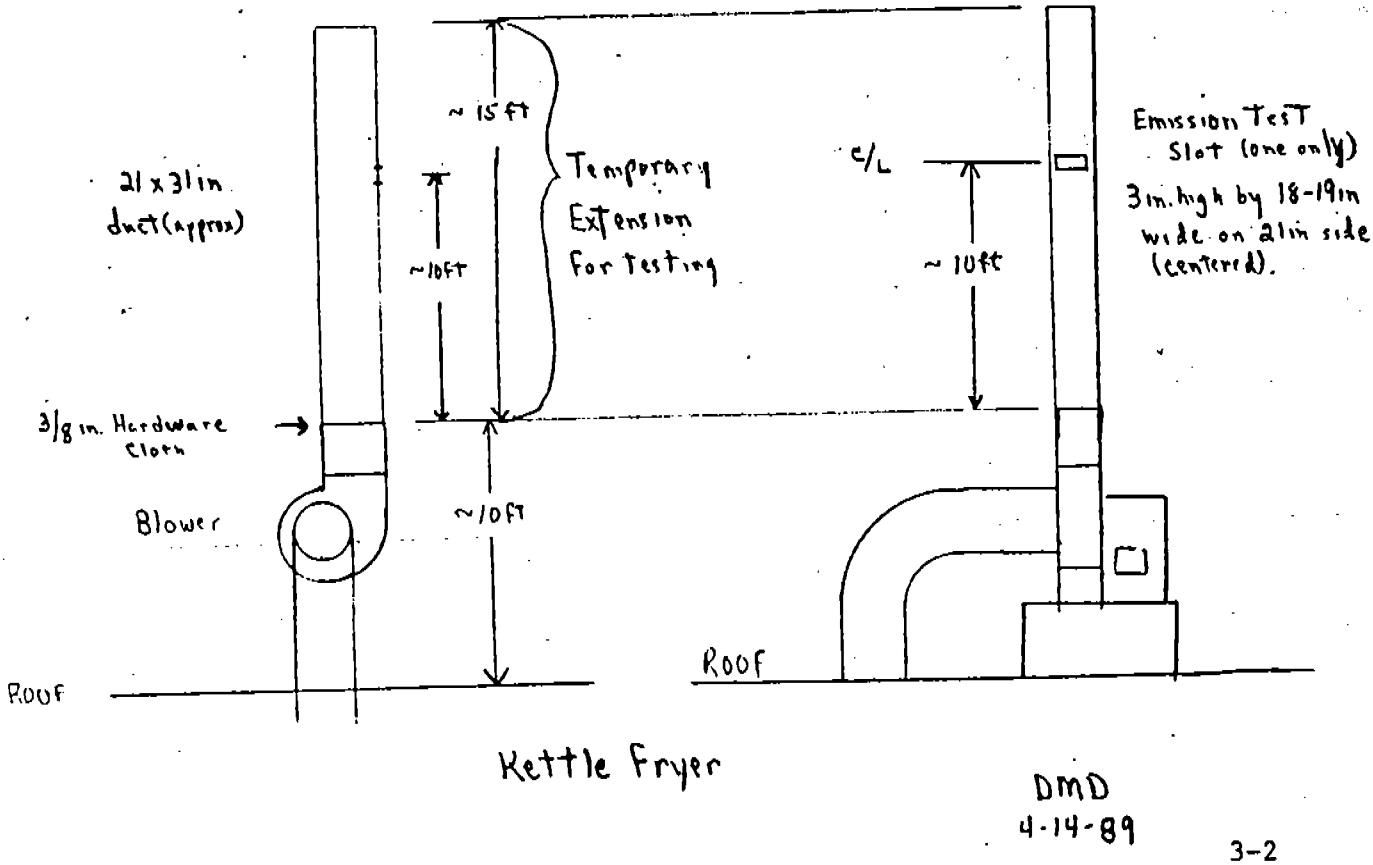
SITE: EAGLE SNACKS
UNIT: Fryer #5
DATE: February 4–5, 1992

ANALYTICAL DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Probe mg	6.6	22.6	15.9	15.03
Filter mg	0.5	0.7	0.6	0.60
Blanks mg	1.5	1.5	1.5	1.50
Subtotal mg	5.6	21.8	15.0	14.13
BACK HALF				
Impingers Inorg mg	5.1	6.5	5.2	5.60
Impingers Org mg	0.0	0.0	1.3	0.43
Blank mg	1.5	1.5	1.5	1.50
Subtotal mg	3.6	5.0	5.0	4.53
Total Weight Gain mg	9.2	26.8	20.0	18.67
EMISSION DATA	**TEST 1**	**TEST 2**	**TEST 3**	**AVERAGE**
FRONT HALF				
Grs/SDCF	0.0007	0.0029	0.0020	0.0019
Lbs/Hr	0.075	0.287	0.199	0.187
BACK HALF				
Grs/SDCF	0.0005	0.0007	0.0007	0.0006
Lbs/Hr	0.048	0.066	0.066	0.060
TOTAL EMISSIONS	**TEST 1**	**TEST 2**	**TEST 3**	**AVERAGE**
Grs/SDCF	0.0012	0.0036	0.0027	0.0025
Lbs/Hrs	0.123	0.352	0.265	0.247

3.0 SITE DESCRIPTION

3.1 Kettle Fryer #5 Stack Exhaust

Samples were collected from a 31.5" x 21.75" rectangular vertical stack located above the roof. The sampling ports are located on a single side of the stack. Figure 3.1 is the site diagram while Figure 3.2 presents the traverse point location.

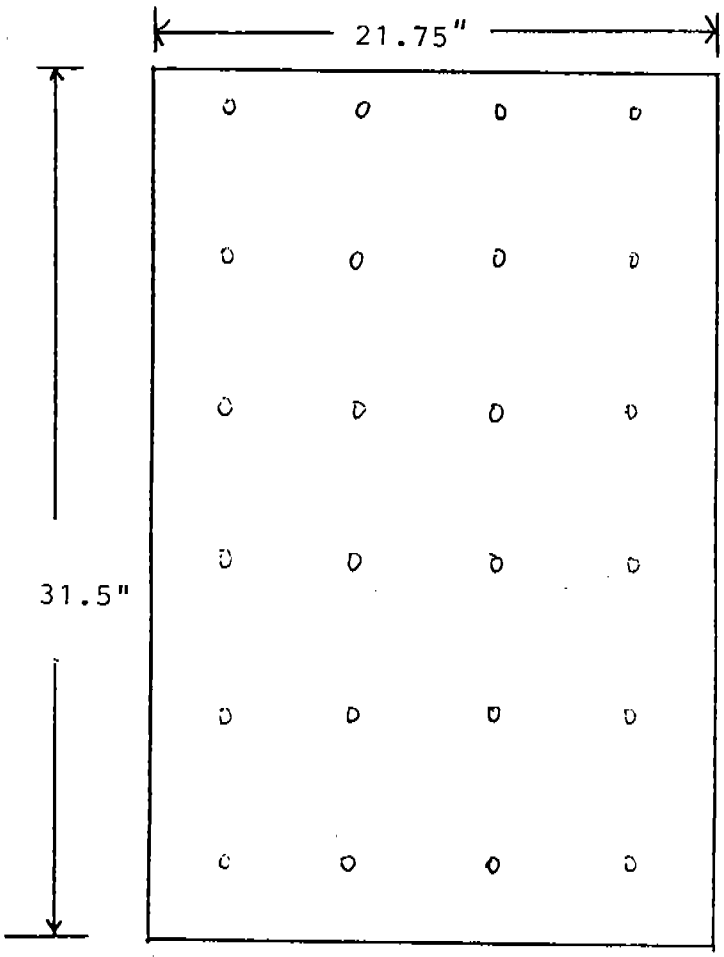


Kettle Fryer

DMD
4-14-89

3-2

FIGURE 3.1



TRAVERSE POINT LOCATION STACK EXHAUST
FIGURE 3.2

TRAVERSE POINT	POINT LOCATION
1	2.62
2	7.87
3	13.13
4	18.38
5	23.63
6	28.87

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Traverse Point Location

Traverse point locations were determined by utilizing EPA Method 1, "Sample and Velocity Traverses for Stationary Sources."

4.2 Particulate Sampling and Analysis

Particulates were collected by EPA Method Five. Triplicate three hour tests were conducted on the kettle fryer stack exhaust.

The sampling train consisted of a glass nozzle, glass probe, heated flex line, heated four inch filter, three glass impingers, silica gel impinger, pump, and a calibrated dry gas meter. The first and second impingers each contained 100 milliliters of distilled water. The third impinger was empty. The fourth contained silica gel to protect the pump. Figure 4.1 depicts the sampling train.

After assembling the sampling train, it was checked for leaks and the sampling was not started until a leak rate of less than 0.02 cfm at 15 inches of mercury was achieved.

During the testing, the sampling was performed isokinetically on each traverse. The velocity measurements were made at individual traverse points using a Type "S" pitot tube connected to an inclined manometer with divisions measuring 0.02 inches of water. The stack temperature was measured by using a Type K thermocouple wire attached to a calibrated digital readout.

Upon completion of each test, the sampling train was checked for leaks before disassembling the sampling system. The nozzle and the probe were removed from the train. The probe was rinsed and brushed with a nylon brush on a stainless steel handle. The probe and nozzle were rinsed with acetone. The rinses were placed into a 950 milliliter amber glass bottle. The bottle was labeled and retained for analysis.

The impinger solutions were re-measured and recovered with distilled water. The solutions were placed into 950 milliliter amber glass bottles. The bottles were labeled and retained for analysis. In addition, the impingers were rinsed with acetone, and the solutions were placed into the probe rinse bottle labeled for acetone.

The glass fiber filter was removed from the filter holder and was placed into a petri dish. The front half of the filter holder was rinsed with acetone. The back-half of the filter holder was rinsed with distilled water. The distilled water rinses were placed with the impinger solutions and the acetone rinses were placed with acetone probe rinse.

The analysis was performed by evaporating the acetone probe rinses to dryness in tared beakers. The water solutions were combined and extracted with 50 milliliters of petroleum ether. The inorganic and organic fractions were evaporated in tared beakers. The beakers and filter were placed into a desiccator and were weighed to constant weights.

The data reduction was performed by using EPA Method 5.1 calculations.

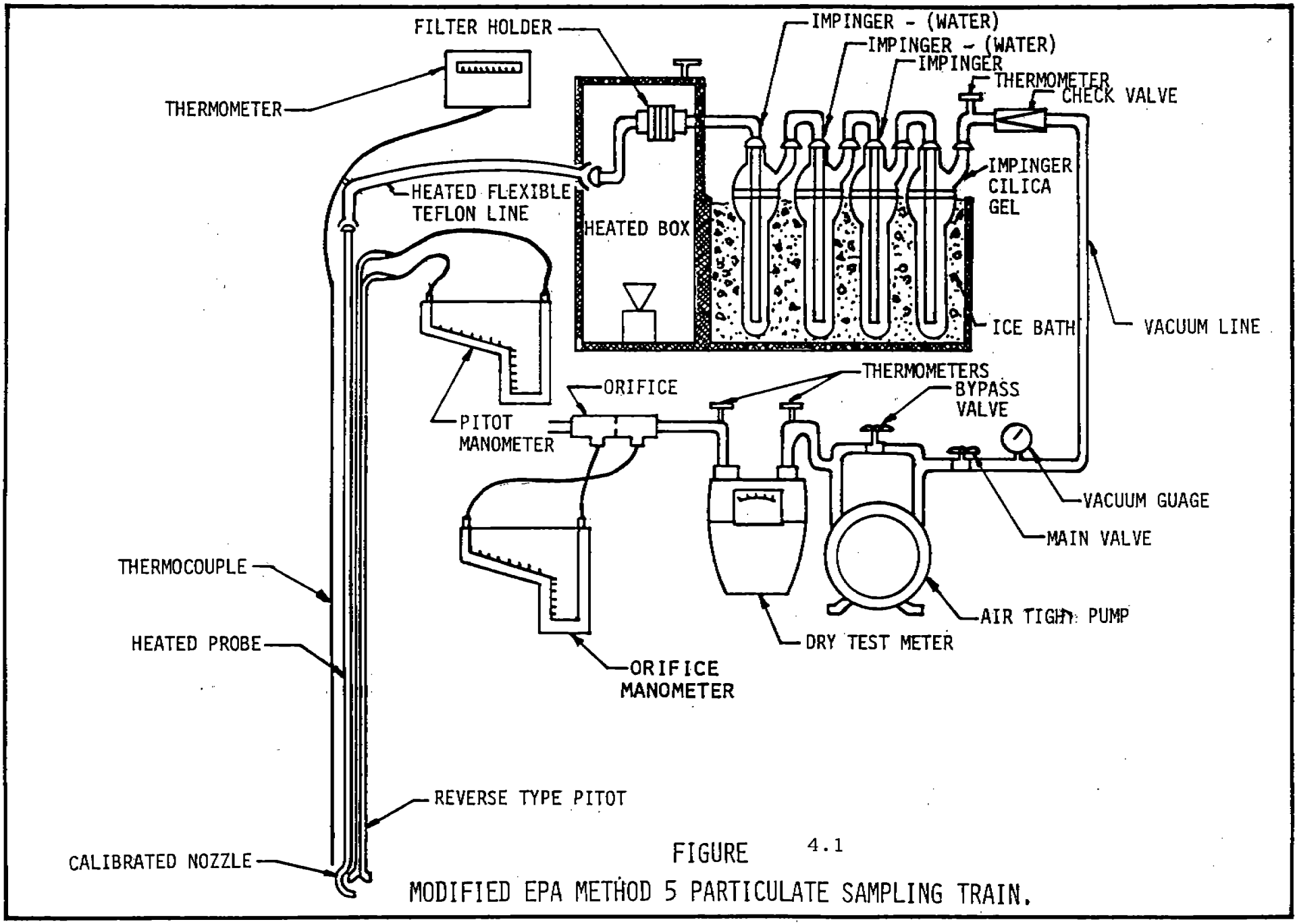


FIGURE 4.1

MODIFIED EPA METHOD 5 PARTICULATE SAMPLING TRAIN.

4.3 Inorganic Gas Determination

During each particulate test, gaseous samples from the stack were sampled and analyzed for carbon dioxide and oxygen. Bag samples were collected and analyzed with a continuous monitoring system. The CEM system consisted of a Horiba PIR 2000 carbon dioxide gas analyzer and a Teledyne electrochemical oxygen analyzer. The results were printed on a Westronics Data Logger.

The instruments were zeroed and spanned prior to and after the sampling period.

5.0 QUALITY ASSURANCE

5.1 Field Equipment Quality Assurance

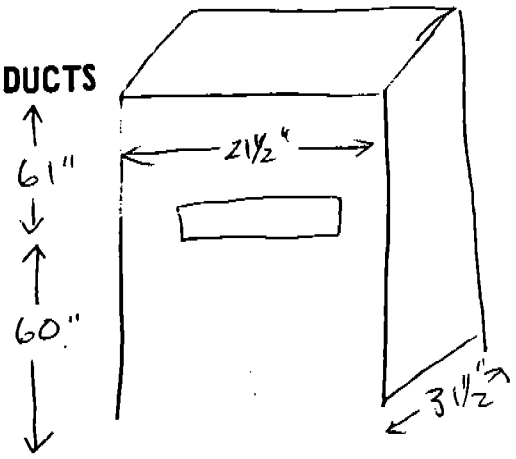
The calibration of the pitot tube, dry gas meter, digital thermometers, and manometers were performed by utilizing standard EPA Methodology, "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods (EPA-600/4-77-0278).

WESTERN ENVIRONMENTAL SERVICES

APPENDIX A

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Eagle Snacks
DATE 2-3-92
SAMPLING LOCATION Fryer 8 and Fryer 5
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) _____
NEAREST UPSTREAM DISTURBANCE _____
NEAREST DOWNSTREAM DISTURBANCE _____
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					2,62
2					7.87
3					13.13
4					19.38
5					23.63
6					28.87

PA (Dur) 232
4/72

A00001

FIELD DATA

PLANT Eagle Stacks
DATE 2-14-92
SAMPLING LOCATION Fryer #5
SAMPLE TYPE Particulate
RUN NUMBER #1 - 180 min run
OPERATOR Hastreiter
AMBIENT TEMPERATURE 69
BAROMETRIC PRESSURE 29.95
STATIC PRESSURE, (P_s) -0.16
FILTER NUMBER (s) 3.200

15 m/s
22 grams
37 V/c

PROBE LENGTH AND TYPE 5-#75
NOZZLE I.D. .220
ASSUMED MOISTURE, % 2%
SAMPLE BOX NUMBER WES #10
METER BOX NUMBER WES #10
METER $\Delta H_@$ WES #10
C FACTOR
PROBE HEATER SETTING 250°
HEATER BOX SETTING 250°
REFERENCE Δp #9 (0-1")

0404

SCHEMATIC OF TRAVERSE POINT LAYOUT

Preleak ≤ .007 cfm at 15" READ AND RECORD ALL DATA EVERY 7½ MINUTES Postleak ≤ .018 cfm at 5"

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
					DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
FAR LEFT	0	1140	388.570									
1		1147½	393.605	0.58	1.72	1.72	70	70	68	3	245	66
2	15	1155	398.970	0.65	1.95	1.95	71	82	72	3	247	49
3		1202½	404.485	0.66	1.97	1.97	77	86	74	3	249	63
4	30	1210	409.725	0.60	1.81	1.81	76	89	77	3	248	64
5		1217½	415.140	0.64	1.93	1.93	77	91	77	3	248	62
MID LEFT 6	45	1225	418.760	0.28	0.84	0.84	81	93	79	2	246	61
1		1232½	423.520	0.50	1.49	1.49	85	91	80	2	250	60
2	60	1240	428.900	0.64	1.92	1.92	81	93	81	3	250	60
3		1247½	434.300	0.62	1.89	1.89	74	95	82	3	249	57
4	75	1255	439.480	0.58	1.79	1.79	69	96	83	3	250	56
5		102½	444.555	0.55	1.70	1.70	69	97	84	3	249	58
MID RGHT 6	90	110	449.640	0.55	1.70	1.70	69	97	85	3	248	57
1		117½	454.490	0.46	1.43	1.43	68	98	86	2	248	58
2	105	125	458.875	0.42	1.31	1.31	67	99	87	3	251	59
3		132½	463.375	0.50	1.55	1.55	69	100	87	2	251	59
4	120	140	468.020	0.54	1.67	1.67	72	100	88	3	250	56
5		147½	472.980	0.52	1.61	1.61	75	103	90	3	253	60
FAR RGHT 6	135	155	477.750	0.48	1.48	1.48	78	104	92	3	251	57
1		202½	482.160	0.40	1.24	1.24	77	107	94	3	252	58
2	150	210	486.675	0.42	1.31	1.31	72	107	94	2	252	57
3		217½	491.090	0.39	1.22	1.22	72	108	96	2	252	58
4	165	225	495.325	0.37	1.16	1.16	71	109	97	2	252	58
5		232½	499.850	0.42	1.31	1.31	77	109	98	2	251	58
COMMENTS: 6	180	240	505.085	0.56	1.76	1.76	73	110	99	2	254	59
			(116.515)	(0.509)		(1.57)	(74)		(91)			

EPA (Bur) 235
(224) (180)

FAR LEFT
MID LEFT
MID RGHT
FAR RGHT

AUG 2002

DESICCATION OF SOLID SAMPLES TO CONSTANT WEIGHT

Completion Dates
1. _____ 2. _____
3. _____ 4. _____
Indicate by numbers in box under Sample column.

Eagle Snacks
Fryer #5
Part #3

Requestor _____
JN _____
Assigned to _____
Date Assigned _____

ALL WEIGHTS IN GRAMS

TARE WEIGHT				TARE + SAMPLE WEIGHT	
1. 107.2720	9.	Probe	180.2	1. 107.2960	9.
2. 107.2724	10.	SAMPLE NUMBER	FILTER OR CONTAINER #	2. 107.2883	10.
3. 107.2720	11.	FILTER OR CONTAINER PLUS SAMPLE	107.2880	3. 107.2872	11.
4.	12.			4. 107.2885	12.
5.	13.	FILTER OR CONTAINER TARE	107.2721	5. 107.2895	13.
6.	14.			6.	14.
7.	15.	SAMPLE	.0159	7.	15.
8.	16.		15.9	8.	16.
1. 0.3502	9.	Filter	3.202	1. 0.3506	9.
2. 0.3499	10.	SAMPLE NUMBER	FILTER OR CONTAINER #	2. 0.3506	10.
3. 0.3498	11.	FILTER OR CONTAINER PLUS SAMPLE	0.3506	3. 0.3507	11.
4.	12.			4.	12.
5.	13.	FILTER OR CONTAINER TARE	0.3500	5.	13.
6.	14.			6.	14.
7.	15.	SAMPLE	0.0006	7.	15.
8.	16.		0.6	8.	16.
1. 110.9586	9.	Imp I	182.2	1. 110.9620	9.
2. 110.9588	10.	SAMPLE NUMBER	FILTER OR CONTAINER #	2. 110.9650	10.
3.	11.	FILTER OR CONTAINER PLUS SAMPLE	110.9639	3. 110.9632	11.
4.	12.			4. 110.9642	12.
5.	13.	FILTER OR CONTAINER TARE	110.9587	5. 110.9644	13.
6.	14.			6.	14.
7.	15.	SAMPLE	.0052	7.	15.
8.	16.		5.2	8.	16.
1. 107.0100	9.	Imp O	183.2	1. 107.0025	9.
2. 107.0104	10.	SAMPLE NUMBER	FILTER OR CONTAINER #	2. 107.0112	10.
3.	11.	FILTER OR CONTAINER PLUS SAMPLE	107.0115	3. 107.0098	11.
4.	12.			4. 107.0114	12.
5.	13.	FILTER OR CONTAINER TARE	107.0102	5. 107.0121	13.
6.	14.			6.	14.
7.	15.	SAMPLE	.0013	7.	15.
8.	16.		1.3	8.	16.

A00007

FIELD DATA REDUCTION

Site: EAGLE SNACKS
Date: February 4, 1992
Unit: Fryer #5
Test: Part. #1

	GAS METER READING	VELOCITY HEAD	SQUARE ROOT	ORIFICE PRESSURE DELTA H	STACK TEMPERATURE	DRY GAS METER TEMPERATURE	
Far Left	388.570	0.58	0.761577	1.72	70	70	68
	505.085	0.65	0.806225	1.95	71	82	72
		0.66	0.812403	1.97	77	86	74
	116.515	0.60	0.774597	1.81	76	89	77
		0.64	0.800000	1.93	77	91	77
	(DIFFERENCE)	0.28	0.529150	0.84	81	93	79
Mid Left		0.50	0.707107	1.49	85	91	80
		0.64	0.800000	1.92	81	93	81
		0.62	0.787400	1.89	74	95	82
		0.58	0.761577	1.79	69	96	83
		0.55	0.741619	1.70	69	97	84
		0.55	0.741619	1.70	69	97	85
Mid Right		0.46	0.678232	1.43	68	96	86
		0.42	0.648074	1.31	67	99	87
		0.50	0.707106	1.55	69	100	87
		0.54	0.734846	1.67	72	100	88
		0.52	0.721110	1.61	75	103	90
		0.48	0.692820	1.48	78	104	92
Far Right		0.40	0.632455	1.24	79	107	94
		0.42	0.648074	1.31	72	107	94
		0.39	0.624499	1.22	72	108	96
		0.37	0.608276	1.16	71	109	97
		0.42	0.648074	1.31	77	109	96
		0.56	0.748331	1.76	73	110	99
			---	AVERAGE SQUARED			
		AVERAGES	0.713132	0.509	1.57	74	91

A06008

FIELD DATA REDUCTION

Site: EAGLE SNACKS
Date: February 5, 1992
Unit: Fryer #5
Test: Part. #2

	GAS METER READING	VELOCITY HEAD	SQUARE ROOT	ORIFICE PRESSURE DELTA H	STACK TEMPERATURE	DRY GAS METER TEMPERATURE	
Far	506.039	0.58	0.761577	1.65	61	39	39
Left	614.227	0.64	0.800000	1.83	61	42	40
	---------	0.68	0.824621	1.95	62	48	42
	108.188	0.64	0.800000	1.84	63	51	42
	=========	0.34	0.583095	0.98	66	54	43
	(DIFFERENCE)	0.36	0.600000	1.03	68	54	44
Mid		0.42	0.648074	1.20	69	55	45
Left		0.42	0.648074	1.20	70	56	46
		0.60	0.774596	1.73	66	57	47
		0.68	0.824621	1.98	66	60	49
		0.60	0.774596	1.72	75	62	50
		0.53	0.728010	1.53	74	65	52
Mid		0.40	0.632455	1.19	61	66	55
Right		0.43	0.655743	1.26	66	66	55
		0.48	0.692820	1.42	65	67	56
		0.52	0.721110	1.54	64	69	57
		0.38	0.616441	1.11	74	70	58
		0.37	0.608276	1.08	75	69	59
Far		0.38	0.616441	1.11	75	68	60
Right		0.38	0.616441	1.11	71	68	60
		0.38	0.616441	1.10	78	69	60
		0.40	0.632455	1.19	63	69	61
		0.40	0.632455	1.19	64	71	62
		0.50	0.707106	1.49	65	72	63
			---------	AVERAGE SQUARED			
		AVERAGES	0.688144	0.474	1.39	68	57
			=========	=======	==========	=========	=========

FIELD DATA REDUCTION

Site: EAGLE SNACKS
Date: February 5, 1992
Unit: Fryer #5
Test: Part. #3

	GAS METER READING	VELOCITY HEAD	SQUARE ROOT	ORIFICE PRESSURE DELTA H	STACK TEMPERATURE	DRY GAS METER TEMPERATURE	
Far	614.783	0.57	0.754983	1.67	73	66	64
Left	726.543	0.63	0.793725	1.88	65	71	65
	---	0.67	0.818535	2.01	65	77	66
	111.760	0.68	0.824621	2.05	65	78	67
	=========	0.42	0.648074	1.27	67	80	69
	(DIFFERENCE)	0.40	0.632456	1.20	69	80	70
Mid		0.46	0.678233	1.38	69	80	70
Left		0.48	0.692820	1.43	74	81	71
		0.60	0.774596	1.80	71	81	71
		0.60	0.774596	1.81	71	84	73
		0.58	0.761577	1.74	75	85	73
		0.54	0.734846	1.65	65	85	74
Mid		0.48	0.692820	1.46	65	85	74
Right		0.42	0.648074	1.28	67	87	76
		0.47	0.685565	1.43	68	87	77
		0.42	0.648074	1.28	70	88	77
		0.42	0.648074	1.26	78	89	79
		0.40	0.632455	1.20	82	91	80
Far		0.40	0.632455	1.23	66	91	81
Right		0.42	0.648074	1.30	66	91	82
		0.40	0.632455	1.24	66	92	82
		0.42	0.648074	1.30	67	93	83
		0.30	0.547722	0.93	68	94	84
		0.28	0.529150	0.87	66	93	85
			---	AVERAGE SQUARED			
		AVERAGES	0.686752	0.472	1.44	69	80
			=========	=======	==========	=========	=========

A06010

WESTERN ENVIRONMENTAL SERVICES

APPENDIX B

WESTERN ENVIRONMENTAL SERVICES

GAS METER CALIBRATION

Meter #: WES #10
Pb: 29.95
Date: January 3, 1992
Calibrator: Ty Hastriter

Orifice	Standard Meter Start	Standard Meter Finish	Temp F	Test Meter Start	Test Meter Finish	Temp F	Time Min	V	Delta H
0.50	963.106	966.890	63	379.738	383.433	65	10	1.027	1.93
0.50	966.890	970.708	63	383.433	387.153	66	10	1.031	1.89
1.00	970.917	976.222	63	387.362	392.514	68	10	1.037	1.95
1.00	976.222	981.526	63	392.514	397.693	71	10	1.037	1.94
2.00	981.855	989.365	63	398.000	405.287	73	10	1.045	1.93
2.00	989.365	996.872	63	405.287	412.596	74	10	1.044	1.92
						Average		1.037	1.93
								=======	=======

WESTERN ENVIRONMENTAL SERVICES

PITOT TUBE CALIBRATION

Date: JANUARY 17, 1992
By: B.WESSEL
Number: 23
Source: Magnehlic 0-2" 0-5"

Delta P std	Delta P leg 1	Delta P leg 2	Cp leg 1	Cp leg 2
0.25	0.30	0.30	0.91	0.91
1.00	1.25	1.20	0.89	0.91
1.90	3.00	2.95	0.80	0.80
		Averages	0.87	0.88
		Average	0.87	

B06002

WESTERN ENVIRONMENTAL SERVICES

APPENDIX C

WESTERN ENVIRONMENTAL SERVICES

NOMENCLATURE

%CO	Percent CO by volume, dry
$\%CO_2$	Percent CO_2 by volume, dry
%EA	Percent excess air in stack gas
%I	Percent Isokinetic
%M	Percent Moisture in Stack Gas, by Volume
$\%N_2$	Percent N_2 by volume, dry
$\%O_2$	Percent O_2 by volume, dry
A_s	Stack Area, ft^2
C_p	Pitot Tube Coefficient
C_{sf}	Particulate concentrations at standard conditions (1), dry, based on probe, cyclone and filter catch, GRS/SDCF
C_{st}	Particulate concentration at standard conditions (1), dry, based on total catch, GRS/SDCF
D_n	Sampling nozzle diameter, in.
E_f	Particulate emission rate, based on probe, cyclone and filter catch, lbs/hr
E_t	Particulate emission rates based on total particulate catch, lbs/hr
I_c	Percent of particulate caught in impingers
M_d	Mole Fraction Dry Stack Gas
M_f	Particulate collected in probe, cyclone and filter, mg.
M_t	Total particulate collected mg.
MW	Molecular Weight of Wet Stack Gas, gm/gm-mole
MW_c	Molecular Weight of Chemical
MW_d	Molecular Weight of Dry Stack Gas, gm/gm-mole
P	Velocity head, in. H_2O
P_b	Barometric Pressure, in. Hg.
PE_f	Particulate emission rate on a process basis, probe, cyclone and filter catch
PE_t	Particulate emission rate on a process basis, Total catch
P_m	Average Orifice Pressure Drop, in. Hg.

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NOMENCLATURE
(CONT)

PPM	Parts per million
P_s	Stack Gas Pressure, in. Hg., absolute
P_u	Unit process rate
Q_a	Stack Gas Flow Rate at Stack Conditions, ft^3/min
Q_s	Stack Gas Flow Rate at Standard Conditions (1), dry ft^3/min
T_m	Average Dry Gas Meter Temperature, ^oF.
T_s	Stack Gas Temperature, ^oF
T_s	Average Stack Gas Temperature, ^oF
T_{std}	Standard Temperature, ^oF
T_t	Net time of test min.
V_m	Volume of Dry Gas Sampled at Meter Conditions, ft^3
$V_{m_{std}}$	Volume of Dry Gas Sampled at Standard Conditions (1), ft^3
V_s	Average Stack Gas Velocity, Stack Conditions, ft/sec
V_w	Total H_2O Collected in Impingers and Silica Gel, ml
$V_{w_{std}}$	Volume of Water Vapor Collected at Standard Conditions (1), ft^3

WESTERN ENVIRONMENTAL SERVICES

CALCULATIONS

1. Volume of water vapor at standard conditions [1]

$$V_{w_{std}} = .00267 * \frac{460 + T_{std}}{29.92} * Vlc$$

2. Volume of dry gas sampled at standard conditions [1]

$$V_{m_{std}} = 17.64 * \frac{V_m (P_b + P_m)}{(T_m + 460)}$$

3. Percent moisture in stack gas by volume.

$$\%M = \frac{100 * V_{w_{std}}}{V_{w_{std}} + V_{m_{std}}}$$

4. Mole fraction dry stack gas.

$$M_s = \frac{100 - \%M}{100}$$

5. Molecular weight of dry stack gas (gm/gm - Mole)

$$MW_d = [(\%\ CO_2 * .44) + (\%\ O_2 * .32) + (\%\ N_2 * .28) + (\%\ CO * .28) + (\%\ \text{Additional Gas} * \text{MW of Additional Gas})]$$

6. Molecular weight of wet stack gas (gm/gm - Mole)

$$MW + (18 * Bwo) + [(1-Bwo) * MW_d]$$

7. Stack gas velocity at stack conditions [2], (ft/sec)

$$V_s = 85.49 * CP * \sqrt{\Delta P} * \frac{\sqrt{(T_s + 460)}}{Ms * P_s}$$

8. Stack gas volumetric flow rate at stack conditions.

$$Q_a = V_s * A_s * 60$$

CALCULATIONS

9. Stack gas volumetric folw rate at standard conditions [1]

$$Q_s = Q_a * \frac{528}{460 + T_s} * \frac{P_s}{29.92} * (1.00 - Bwo)$$

10. Percent isokinetic

$$\%I = \left[\frac{(T_s + 460) * V_{m\,std}}{P_s * V_s * AN * T_t} * (1 - Bwo) \right] * .0945$$

11. Particulate Concentrations at standard conditions [1], dry, based on probe, cyclone and filter catch.

$$C_{sf} = \frac{M_f * 15.43}{V_{m\,std} * 1000}$$

12. Particulate concentration at standard conditions [1], dry, based on total catch.

$$C_{st} = \frac{M_t * 15.43}{V_{m\,std} * 1000}$$

13. Particulate emission rate, based on probe, cyclone, and filter catch.

$$E_f = \frac{M_f * 60 * Q_s}{454{,}000 * V_{m\,std}}$$

14. Particulate emission rate, based on total catch.

$$E_t = \frac{M_t * 60 * Q_s}{454{,}000 * V_{m\,std}}$$

CALCULATIONS

15. Particulate emission rate on a process basis, probe, cyclone, and filter catch.

$$PE_f = \frac{E_f}{P_u}$$

16. Particulate emission rate on a process basis, total catch.

$$PE_t = \frac{E_f}{P_u}$$

17. Particulate emission rate, part per million.

$$ppm = \frac{M_t}{V_{m_{std}}} * \frac{863.3}{MW_c}$$

(1) Standard conditions: 68^0, 29.92 "Hg

(2) $\sqrt{\Delta P_s * (T_s + 460)}$ is determined by averaging the square root of the product of the velocity head (ΔP_s) and the absolute stack temperature (T_s + 460) for each indibidual point

WESTERN ENVIRONMENTAL SERVICES

APPENDIX D

ANHEUSER-BUSCH COMPANIES

March 4, 1992

Mr. Thomas L. Rooney
Western Environmental Services
1010 South Pacific Coast Highway
Redondo Beach, California 90277

Re: **Visalia Eagle Snacks, Inc.**
Process Weight Rate
Kettle Fryer No. 5

Dear Tom:

Attached is a copy of the plant's production records for February 4 and 5, 1992. These records include the testing periods for Kettle Fryer No. 5 as noted on each record.

Please include this process rate data in your pending report for your particulate emission testing on Kettle Fryer No. 5. If you have other questions or need more information, please call me at my St. Louis office.

Yours truly,

ANHEUSER-BUSCH COMPANIES, INC.

Donald M. DeHart
Sr. Environmental Engineer
Environmental Affairs Department

Enclosure
Tel: 314/577-4158
Fax: " " -1032

DMD:cd
3492-2

PRODUCTION REPORT FOR WORKSTATION VKET1 - VIS KET FRY PROC 1st SHFT

SUPERVISOR: MR
PRODUCTION MANAGER: RL

DATE: 02/04/92
SHIFT: 1
JOB#: 275796

PRODUCT PRODUCED: 700687 - RUSSET POTATO CHIPS
QUANTITY PRODUCED: 7,545 LBS.

			HOURS	
TIME WORKSTATION STARTED UP:	07:30AM	TOTAL MACHINE TIME:	56.00	100.0%
TIME WORKSTATION SHUT DOWN:	03:30PM	DOWN TIME - PLANNED:	0.00	0.0%
		DOWN TIME - UNPLANNED:	0.00	0.0%
		PRODUCTIVE RUNNING TIME:	56.00	100.0%

	UNIT OF MEAS	ACTUAL USAGE
RAW POTATOES - RUSSETS	LBS.	26,700

RAW WASTE: 250 LBS.
FINISHED WASTE: 420 LBS.

COMMENTS

Ave. Fryer input per shift = $\frac{\text{Actual Usage} - \text{Raw Waste}}{\text{Prod. Running Time}}$

$= \frac{26,700 - 250}{56.00} = 472$ lb/hr per fryer

Kettle #5, Run 1

PRODUCTION REPORT FOR WORKSTATION VKET1 - VIS KET FRY PROC 1st SHFT

SUPERVISOR: MR
PRODUCTION MANAGER: RL

DATE: 02/05/92
SHIFT: 1
JOB#: 276183

PRODUCT PRODUCED: 700686 - HAWAIIAN STYLE POT. CHIPS
QUANTITY PRODUCED: 3,525 LBS.

			HOURS	
TIME WORKSTATION STARTED UP:	07:30AM	TOTAL MACHINE TIME:	23.94	100.0%
TIME WORKSTATION SHUT DOWN:	10:55AM	DOWN TIME - PLANNED:	0.00	0.0%
		DOWN TIME - UNPLANNED:	0.00	0.0%
		PRODUCTIVE RUNNING TIME:	23.94	100.0%

	UNIT OF MEAS	ACTUAL USAGE
RAW POTATOES	LBS.	14,190

RAW WASTE: 175 LBS.
FINISHED WASTE: 155 LBS.

COMMENTS

Two products produced from same potatoes. See next page for Process Weights

PRODUCTION REPORT FOR WORKSTATION VKET1 - VIS KET FRY PROC 1st SHFT

SUPERVISOR: MR
PRODUCTION MANAGER: RL

DATE: 02/05/92
SHIFT: 1
JOB#: 276412

PRODUCT PRODUCED: 700731 - BBQ HAWAIIAN POTATO CHIPS
QUANTITY PRODUCED: 4,565 LBS.

TIME WORKSTATION STARTED UP: 11:15AM
TIME WORKSTATION SHUT DOWN: 03:30PM

	HOURS	
TOTAL MACHINE TIME:	29.75	100.0%
DOWN TIME - PLANNED:	0.00	0.0%
DOWN TIME - UNPLANNED:	0.00	0.0%
PRODUCTIVE RUNNING TIME:	29.75	100.0%

	UNIT OF MEAS	ACTUAL USAGE
RAW POTATOES	LBS.	15,900

RAW WASTE: 195 LBS.
FINISHED WASTE: 210 LBS.

COMMENTS

Average input per shift $= \frac{\Sigma(\text{Actual Usage} - \text{Raw Waste})}{\Sigma \text{ Prod. Running Time}}$

$= \frac{(14{,}190 - 175) + (15{,}900 - 195)}{23.94 + 29.75} = 554$ lb/hr per fryer

Kettle #5, Runs 2 and 3