| | |
|---|---|
| AP42 Section: | 9.13.2 |
| | |
| Title: | Emission Factor Documentation for AP-42 Section 9.13.2.<br>Coffee Roasting Final Report<br><br>September 1995<br><br>APPENDICES ONLY |

# Emission Factor Documentation for AP-42
# Section 9.13.2

## Coffee Roasting

## Final Report

For U. S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Factor and Inventory Group
Research Triangle Park, NC 27711

Attn: Mr. Dallas Safriet (MD-14)
Emission Factor and Inventory Group

Appendices only

EPA Contract 68-D2-0159
Work Assignment No. II-03

MRI Project No. 4602-03

September 1995

# APPENDIX A

## REFERENCE 1

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
CN 027
TRENTON, N.J. 08625

July 1, 1987

MEMORANDUM

TO: Edward Choromanski

FROM: Dipak Ghayal

SUBJECT: Premium Coffee, Wall New Jersey
N.J.D.E.P. I.D. No. 20322

Stack tests were conducted at Premium Coffee, Wall, NJ on Roaster After Burner Exhaust (N.J. Stack No. 002) by Princeton Testing Lab, Princeton, NJ on January 14, 1987. The purpose of the test was to determine particulates emission rate from Roaster After Burner Exhaust, covered by Tracking No. 86-2269, filed under N.J.A.C. 7:27-8.2 and N.J.A.C. 7:27-6.2.

The test results are as follows:

PARTICULATES EMISSION RATE

| Run No. | Allowable Emission Rate (as per 86-2269) lbs/hr | Actual Emission Rate lbs/hr |
|---|---|---|
| 1 | 0.09 | 0.152 |
| 2 | 0.09 | 0.138 |
| 3 | 0.09 | 0.081 |

Technical Services calculations using the raw data supplied, produced substantially the same results.

The operating conditions reported are as follows:

| Run No. | Afterburner Temp. $^{o}$F | Natural Gas Burning Rate CF/hr | Coffee Bean Feed Rate lbs/hr |
|---|---|---|---|
| 1 | 1300 - 1400 | 1876 | 1350 |
| 2 | 1300 - 1400 | 1821 | 1350 |
| 3 | 1300 - 1400 | 1864 | 1350 |

TEST DATA SUMMARY

Process: Roaster/Cyclone/Afterburner

| | Run #1 | Run #2 | Run #3 |
|---|---|---|---|
| Test Date and Times | 1-14-87 10:29-11:47am | 1-14-87 12:28-1:42 pm | 1-14-87 2:11-3:25 pm |
| Stack Diameter, Inches | 18 | 18 | 18 |
| Sampling Nozzle Diameter, Inches | Ø.313 | Ø.313 | Ø.313 |
| Testing Time, Minutes | 72 | 72 | 72 |
| Stack Gas Volume Sampled, ACF | 37.371 | 37.600 | 37.554 |
| Stack Gas Volume Sampled, SCF @ 70 deg. F., 29.92 in.Hg.,dry | 37.3 | 37.1 | 36.9 |
| Stack Gas Temperature, deg. F. | 620 | 614 | 601 |
| Stack Gas Moisture Content, % | 11.6 | 12.3 | 12.6 |
| Stack Gas Composition, | | | |
| %CO2 | 1.90 | 1.90 | 2.00 |
| %O2 | 19.2 | 19.4 | 18.5 |
| Stack Gas Molecular Weight | 27.8 | 27.7 | 27.7 |
| Stack Gas Velocity, Ft./Sec. | 35.5 | 34.8 | 34.2 |
| Stack Gas Flowrate, ACFM | 3,760 | 3,690 | 3,620 |
| Stack Gas Flowrate, SCFM @ 70 deg. F., 29.92 in.Hg.,dry | 1,640 | 1,600 | 1,590 |
| Particulate Captured, Grams | Ø.Ø261 | Ø.Ø242 | Ø.Ø143 |
| Particulate Concentration, | | | |
| Grains/SCF | Ø.Ø11 | Ø.Ø10 | Ø.ØØ6 |
| Grains/ACF | Ø.ØØ5 | Ø.ØØ4 | Ø.ØØ3 |
| Particulate Mass Rate, Lb./Hr. | Ø.152 | Ø.138 | Ø.Ø81 |
| Percent Isokinetic of Test | 105 | 106 | 107 |

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| | Stack temperature | °F | 620 | 614 | 601 | |
| | Moisture | % | 11.6 | 12.3 | 12.6 | |
| | Oxygen | % | 19.2 | 19.4 | 18.5 | |
| | Volumetric flow, actual | ACFM | 3,760 | 3,690 | 3,620 | |
| | Volumetric flow, standard | SCFM | 1,640 | 1,600 | 1,590 | |
| | Percent isokinetic | | 105 | 106 | 107 | |
| Circle: Production or (feed rate) Capacity: | | lbs/hr | 1,350 | 1,350 | 1,350 | |
| | Pollutant concentrations: | | | | | |
| | PM ~~Total~~ Filterable | grains | 0.0261 | 0.0242 | 0.0143 | |
| | $CO_2$ | % | 1.9 | 1.9 | 2.0 | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |
| | | | | | | |
| | Pollutant mass flux rates: | | | | | |
| | PM ~~Total~~ Filt. | gr/SCF | 0.011 | 0.010 | 0.006 | |
| | | | | | | |
| | $CO_2$ | lb/hr | 214 | 208 | 218 | |
| | | | | | | |
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| | | | | | | |
| | | | | | | |
| | Emission factors: | | | | | |
| Filt. | ~~Total~~ PM Emission Rate | lbs/hr | 0.152 | 0.138 | 0.081 | |
| | | | | | | |
| | | | | | | |
| | EMISSION FACTORS | | | | | AVG |
| | Filt. PM | lb/ton | 0.225 | 0.204 | 0.120 | 0.183 |
| | $CO_2$ | lb/ton | 317 | 308 | 323 | 316 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

APPENDIX B

REFERENCE 3

# RECON SYSTEMS, INC.

Route 202 North, P.O. Box 460
Three Bridges, N.J. 08887
201-782-5900

New England 617-752-4217 Pennsylvania 215-433-5511

STACK SAMPLING REPORT FOR

General Foods Corporation
Maxwell House Division
Hoboken, New Jersey
on Rotoclone Inlet and Outlet

INTRODUCTION

The above referenced stacks were sampled for total particulate emissions and percent efficiency on September 9, 1987. This report contains the following information.

rm DEQ-079
86

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR POLLUTION CONTROL

# EMISSION TEST OBSERVATION FORM

1) COMPANY GENERAL FOODS CORPORATION, MAXWELL HOUSE DIVISION

N.J. STACK NO. 059 DEP I.D. NO. 10082

PLANT LOCATION 125 HUDSON ST HOBOKEN

2) PLANT CONTACT ERNIE LaSalle Asst Plt Supt 420-3731 EMISSION TEST DATE(S) 9-4-81

3) SOURCE BEING TESTED CONTINUOUS COOLER PERMIT/ CERTIFICATE NO. 75004

DESCRIPTION OF SOURCE COOLING ZONE AFTER CONTINUOUS ROASTER

4) TESTS ARE BEING CONDUCTED TO DETERMINE COMPLIANCE WITH THE FOLLOWING REGULATIONS. (Indicate all applicable regulations.)

N.J.A.C. 7:27 6.2 EPA NSPS Subpart N/A EPA NESHAPS Subpart N/A

5) TYPE OF CONTROL EQUIPMENT (if applicable) ROTOCLONE

CONTROL EQUIPMENT OPERATING PARAMETERS (During each test)

| PARAMETER | RUN NO. 1 | RUN NO. 2 | RUN NO. 3 |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

6) SOURCE OPERATING PARAMETERS (During each test)

11:15am-12:30pm 1:45pm-3:00pm 3:50pm-5:05pm

| PARAMETER | RUN NO. 1 | RUN NO. 2 | RUN NO. 3 |
|---|---|---|---|
| COOLING ZONE WATER SPRAY (GPM) | 2 GPM | 2 GPM | 3 GPM |
| GREEN BEANS | 16000 lbs/hr | 18000 lbs/hr | 18240 lbs/hr |
| ODOR OFF PROPERTY | UPWIND OF CONTINUOUS COOLER WHICH IS DOWNWIND OF ENTIRE PLANT, THERE WERE FAINT COFFEE ODORS, DOWNWIND OF CONTINUOUS COOLER THERE WERE FAINT COFFEE ODORS, NO SIGNIFICANT DETERMINATION MADE THIS DAY | SAME AS RUN NO. 1 | SAME AS RUN NO. 1 |

7) TYPE OF FUEL BEING FIRED (if applicable) NA

AMOUNT OF FUEL BEING FIRED DURING EACH TEST NA

| RUN NO. 1 | RUN NO. 2 | RUN NO. 3 |
|---|---|---|
| | | |
| | | |
| | | |

8) WERE FUEL SAMPLES TAKEN DURING TESTS? ☐ YES ☒ NO (If yes, record fuel sample number(s) for each test.)

Run No. 1 _____

Run No. 2 _____

Run No. 3 _____

9) WERE ANY OTHER SAMPLES TAKEN DURING TEST? ☐ YES ☒ NO

(If yes, indicate type of sample, run number sample was taken, sampling location and sample numbers.)

| TYPE | RUN NO. | LOCATION | SAMPLE NUMBERS | COMMENT |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

10) ANY PROCESS OR CONTROL EQUIPMENT PROBLEMS DURING ANY TEST? ☐ YES ☒ NO

(If yes, specify the type of problem and indicate during which run it occurred.)

| RUN NO. | PROBLEM |
|---|---|
| 1,2 & 3 | ~200 lb/hr of coffee beans were processed during the stack test. The coffee roaster cannot process > 200 lb/hr of coffee beans. Therefore the control device will not receive > 200 lb/hr of coffee beans. The permit should be amended to show the actual process rate; consequently, the emission rate. |

11) EMISSION TESTS CONDUCTED BY ☐ DEP ☒ COMPANY CONSULTANT

RECON SYSTEMS INC
THREE BRIDGES, NJ
PETER MARSHALL
201 782-5900

INSPECTOR'S SIGNATURE _____

REGIONAL OFFICE REPRESENTED NRO

SUMMARY

The following results were obtained:

| INLET | | | |
|---|---|---|---|
| Run No. | 1 | 2 | 3 |
| Date | 9/9/87 | 9/9/87 | 9/9/87 |
| Time | 1116-1229 | 1346-1503 | 1541-1700 |
| **EMISSIONS DATA** | | | |
| Particulates | | | |
| Pounds/hour | 0.35 | 0.11 | 0.24 |
| Grains/dscf | 0.0123 | 0.0038 | 0.0077 |
| Grains/scf | 0.0119 | 0.0037 | 0.0075 |

| OUTLET | | | |
|---|---|---|---|
| Run No. | 1 | 2 | 3 |
| Date | 9/9/87 | 9/9/87 | 9/9/87 |
| Time | 1115-1230 | 1345-1459 | 1540-1704 |
| **EMISSIONS DATA** | | | |
| Particulates | | | |
| Pounds/hour | 0.017 | 0.014 | 0.014 |
| Grains/dscf | 0.0006 | 0.0005 | 0.0005 |
| Grains/scf | 0.0006 | 0.0005 | 0.0005 |
| UNIT EFFICIENCY, % | 95 | 87 | 94 |

Samples from this project will be retained for sixty days from the date of this report unless otherwise directed.

INLET/OUTLET

## D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| | Stack temperature | °F | 81 / 80 | 81 / 80 | 83 / 81 | |
| | Moisture | % V/V | 2.4 / 2.9 | 2.4 / 2.8 | 3.2 / 3.0 | |
| | Oxygen | % V/V | 21 / 21 | 21 / 21 | 21 / 21 | |
| | Volumetric flow, actual | ACFM | 3460 / 3590 | 3540 / 3670 | 3800 / 3650 | |
| | Volumetric flow, standard | DSCFM | 3290 / 3430 | 3350 / 3510 | 3570 / 3470 | |
| | Percent isokinetic | | 92 / 94 | 91 / 95 | 91 / 94 | |
| Circle: Production or (feed rate) Capacity: | | lbs/hr | 160.9 | 139.0 | 182.4 | |
| | **Pollutant concentrations:** | | | | | |
| | Filterable PM - INLET | GRAINS | 0.031 | 0.009 | 0.021* | MRI CORRECTED VALUE - TEST REPORT SHOWED 0.031 grains |
| | - OUTLET | Grains | 0.0016 | 0.0013 | 0.0013 | |
| | | | | | | |
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| | **Pollutant mass flux rates:** | | | | | |
| | Filt. PM - INLET | gr/dscf | 0.0123 | 0.0038 | 0.0052* | CORRECTED |
| | - OUTLET | gr/dscf | 0.0006 | 0.0005 | 0.0005 | |
| | | | | | | |
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| | | | | | | |
| | Rate | | | | | |
| | **Emission factors:** | | | | | CORRECTED |
| | Filt. PM Emission Rate | lbs/hr | 0.35 | 0.11 | 0.16* | INLET |
| | | lbs/hr | 0.017 | 0.014 | 0.014 | OUTLET |
| | | | | | | |
| | | | | | | |
| | EMISSION FACTORS | | | | | AVG. |
| | Filt. PM INLET | lb/ton | 4.35 | 1.22 | 1.75 | 2.44 |
| | Filt. PM OUTLET | lb/ton | 0.211 | 0.156 | 0.154 | 0.174 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

APPENDIX C

REFERENCE 5

# Ambient Engineering Inc.

1145 Bordentown Avenue
Parlin, New Jersey 08859
(201) 727-8333
*ENVIRONMENTAL ENGINEERING/SYSTEMS*

AIR
WATER
WASTE
NOISE
ENERGY
O.S.H.A.


COMPLIANCE
STACK SAMPLING REPORT
For

Hills Brothers Coffee, Inc.
535 River Road
Edgewater, NJ 07020

Source Tested:

Afterburner #22 Inlet/Outlet
Hills Brothers Coffee, Inc.
Edgewater, NJ

In Fulfillment of Purchase Order No. 32065

Ambient Engineering Project No. 859

Test Date: September 15, 1988

Report Date: October 5, 1988

SUMMARY

The following results were obtained:

| Run No. | INLET 1 | 2 | 3 |
|---|---|---|---|
| Date | 9/15/88 | ---------- | ---------- |
| Time | 0939-1042 | 1450-1557 | 1743-1849 |
| Emissions Data | | | |
| Particulate Emissions | | | |
| pounds/hour | 3.93 | 3.46 | 3.87 |
| grains/dscf | 0.174 | 0.153 | 0.169 |
| grains/scf | 0.138 | 0.123 | 0.135 |
| Total Hydrocarbons (as methane) | | | |
| pounds/hour | 5.49 | 6.58 | 5.84 |
| ppmv (wet) | 657 | 796 | 695 |
| ppmv (dry) | 826 | 988 | 870 |
| Carbon Monoxide | | | |
| pounds/hour | 5.7 | 5.7 | 5.4 |
| ppmv (wet) | 391 | 397 | 371 |
| ppmv (dry) | 492 | 492 | 464 |

| Run No. | OUTLET 1 | 2 | 3 |
|---|---|---|---|
| Date | 9/15/88 | ---------- | ---------- |
| Time | 0937-1042 | 1502-1615 | 1740-1845 |
| Emissions Data | | | |
| Particulate Emissions | | | |
| pounds/hour | 0.32 | 0.27 | 0.22 |
| grains/dscf | 0.009 | 0.006 | 0.005 |
| grains/scf | 0.008 | 0.005 | 0.004 |
| Total Hydrocarbons (as methane) | | | |
| pounds/hour | 0.40 | 0.97 | 0.42 |
| ppmv (wet) | 33 | 62 | 29 |
| ppmv (dry) | 37 | 74 | 35 |
| Carbon Monoxide | | | |
| pounds/hour | 0.89 | 1.81 | 1.60 |
| ppmv (wet) | 41 | 66 | 63 |
| ppmv (dry) | 47 | 79 | 77 |

Samples from this project will be retained for sixty days from the date of this report unless otherwise directed.

# Ambient Engineering Inc.

1145 Bordentown Avenue
Parlin, New Jersey 08859
(201) 727-8333
*ENVIRONMENTAL ENGINEERING/SYSTEMS*

AIR
WATER
WASTE
NOISE
ENERGY
O.S.H.A.


17

Hills Bros. Coffee, Inc.
535 River Road
Edgewater, NJ 07020

PROCESS DESCRIPTION
Stack #22

Hills Brothers Coffee, Inc. is a world leader in the production of fine coffee for sale in retail and commercial establishments. Coffee beans are purchased world wide and shipped to Hills Brothers, Edgewater, New Jersey plant for processing ad packaging.

Stack 22R is the emission to atmosphere point for the coffee Roaster and Stack 22C is the outlet for air used to cool the Roasted Beans.

The process consists of a mixture of green coffee beans being fed on a continuous basis (up to 16 hours per day) into roaster 22. The beans are weighed and fed by gravity on the roaster belts. The feed rate is between 150-170#/minute. Only green coffee beans are roasted in these ovens and the control feed is in the main control room.

Hills Brothers Coffee, Inc.
Process Description
Stack #22/AE #859(9)

Stack outlet flow rates:

| | Run 1 | Run 2 | Run 3 |
|---|---|---|---|
| Actual Flow Rate, ACFM | 14800 | 19500 | 18100 |
| Dry Standard Flow Rate, DSCFM | 4340 | 5300 | 4770 |
| Temperature, °F | 1140 | 1203 | 1206 |

CONTROL APPARATUS ON SOURCE

The Smoke reduction system consists of a variable speed fan, dampers and ductwork that remove smoke from the roaster to a natural gas fired afterburner. By designing this system to provide a negative pressure inside the roaster, smoke is prevented from leaking into the cooler. A low profile hood over the coffee conveying pan between the roaster and cooler reduces the volume of air over the beans. Combined with negative pressure within the roaster, this creates an air velocity over the roasted beans that will further reduce the smoke introduced into the cooler.

# Ambient Engineering Inc.



Hills Brothers Coffee, Inc.
Process Description
Stack #22/AE #859(9)

Roaster Stack #22 was tested on September 15, 1988. The following process data was recorded during the testing"

Roaster #22 Stack:

| Afterburner | Run 1 | Roaster | Run 1 |
|---|---|---|---|
| Finish 1041 | 31738 | Finish 1041 | 43794 |
| Start 0939 | 31677 | Start 0939 | 43748 |
| Total 62 | 61 | Total 62 | 46 |
| | | | |
| Afterburner | Run 2 | Roaster | Run 2 |
| Finish 1558 | 32055 | Finish 1558 | 44021 |
| Start 1446 | 31987 | Start 1446 | 43969 |
| Total 72 | 68 | Total 72 | 52 |
| | | | |
| Afterburner | Run 3 | Roaster | Run 3 |
| Finish 1846 | 32216 | Finish 1846 | 44140 |
| Start 1740 | 32152 | Start 1740 | 44093 |
| Total 66 | 64 | Total 66 | 47 |

*Natural gas meter readings in nearest 100 cu ft.

Production of 170#/min was constant during the testing.

Note: The roaster #22 was in continuous operation during the stack testing. The production rate remained at 170 #/min and was monitored by the Dep. representative Mr. M. Klein, of the Metropolitan Regional Office.

Filename: COFFEE5.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 1 | Stack temperature | Deg F | 553 | 555 | 554 | |
| ROASTER--AFTERBURNE INLET | Moisture | % | 20.5 | 19.4 | 20.1 | |
| | Oxygen | % | 15.4 | 15.3 | 15.5 | |
| | Volumetric flow, actual | acfm | 6250 | 6200 | 6310 | |
| | Volumetric flow, standard* | dscfm | 2640 | 2650 | 2670 | |
| | Isokinetic variation | % | 106 | 104 | 105 | |
| Circle: Production or feed rate Capacity: | | TPH | 5.1 | 5.1 | 5.1 | |
| | Pollutant concentrations: | | | | | |
| | Filterable PM | G/dscf | 0.174 | 0.152 | 0.169 | |
| | THC as methane | ppmdv | 826 | 988 | 870 | |
| | CO | ppmdv | 492 | 492 | 464 | |
| | CO2 | % | 3.4 | 3.3 | 3.3 | |
| | Pollutant mass flux rates: | | | | | |
| | Filterable PM | lb/hr | 3.93 | 3.46 | 3.87 | |
| | THC as methane | lb/hr | 5.49 | 6.58 | 5.84 | |
| | CO | lb/hr | 5.67 | 5.69 | 5.40 | |
| | CO2 | lb/hr | 615 | 599 | 604 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | Filterable PM | lb/ton | 0.771 | 0.678 | 0.759 | 0.736 |
| | THC as methane | lb/ton | 1.076 | 1.29 | 1.15 | 1.17 |
| | CO | lb/ton | 1.11 | 1.12 | 1.06 | 1.10 |
| | CO2 | lb/ton | 121 | 118 | 118 | 119 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | Filterable PM | kg/Mg | 0.385 | 0.339 | 0.379 | 0.368 |
| | THC as methane | kg/Mg | 0.538 | 0.65 | 0.573 | 0.585 |
| | CO | kg/Mg | 0.555 | 0.56 | 0.530 | 0.548 |
| | CO2 | kg/Mg | 60.3 | 58.8 | 59.2 | 59.4 |

Filename: COFFEE5A.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 2 | Stack temperature | Deg F | 1142 | 1203 | 1205 | |
| ROASTER--AFTERBURNE OUTLET | Moisture | % | 11.6 | 15.8 | 17.6 | |
| | Oxygen | % | 12.8 | 12.3 | 12.4 | |
| | Volumetric flow, actual | acfm | 14800 | 19500 | 18100 | |
| | Volumetric flow, standard* | dscfm | 4350 | 5270 | 4770 | |
| | Isokinetic variation | % | 94 | 99 | 101 | |
| Circle: Production or feed rate Capacity: | | TPH | 5.1 | 5.1 | 5.1 | |
| | Pollutant concentrations: | | | | | |
| | Filterable PM | G/dscf | 0.009 | 0.006 | 0.005 | |
| | THC as methane | ppmdv | 37 | 74 | 35 | |
| | CO | ppmdv | 47 | 79 | 77 | |
| | CO2 | % | 4.9 | 5.3 | 5.3 | |
| | Pollutant mass flux rates: | | | | | |
| | Filterable PM | lb/hr | 0.320 | 0.270 | 0.220 | |
| | THC as methane | lb/hr | 0.40 | 0.97 | 0.417 | |
| | CO | lb/hr | 0.892 | 1.82 | 1.60 | |
| | CO2 | lb/hr | 1461 | 1914 | 1733 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | Filterable PM | lb/ton | 0.0627 | 0.0529 | 0.0431 | 0.0529 |
| | THC as methane | lb/ton | 0.0788 | 0.191 | 0.0818 | 0.117 |
| | CO | lb/ton | 0.175 | 0.356 | 0.314 | 0.282 |
| | CO2 | lb/ton | 286 | 375 | 340 | 334 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | Filterable PM | kg/Mg | 0.0314 | 0.02647 | 0.0216 | 0.0265 |
| | THC as methane | kg/Mg | 0.0394 | 0.0955 | 0.0409 | 0.0586 |
| | CO | kg/Mg | 0.0874 | 0.178 | 0.157 | 0.141 |
| | CO2 | kg/Mg | 143 | 188 | 170 | 167 |

APPENDIX D

REFERENCE 7

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
Bureau of Technical Services
CN 411
Trenton, N.J. 08625-0411
(609) 530-4041

#7

December 4, 1990

MEMORANDUM

TO: Chief, Bureau of Enforcement Operations

THROUGH: Edward Choromanski

FROM: Michael Pratt

SUBJECT: Nestle Foods Corporation
APC Plant ID No. 20004
NJ Stack No. 028
P/CT 90511
Log No. 89-1427

Emission tests were conducted at the above referenced facility on three (3 out of five (5) continuous roasters controlled by a thermal afterburner.

The purpose of these tests was to determine:

1) Particulate, CO and THC emissions and then to compare emission results for each air contaminant to the P/CT No. 90511 allowables.

2) Thermal afterburner THC destruction efficiency.

NOTES:

In August 10, 1990 letter to Edward Choromanski subject company stated the following.

a) Stack tests will be performed during operation of their 3 largest continuous roasters (worse case scenario)

b) Capacity of each of these 3 continuous roasters was given as 4,150 lb/hr. (versus P/CT No. 90511 5,000 lb/hr).

c) Will amend P/CT No. 90511 to restrict their operations to maximum of 3 continuous roasters at any time.

Richelle Burkeen reviewed the submitted test report. Her review indicated the following:

1) Production rate was 4,150 lb/hr or 100% for each of the 3 continuous roasters capacity (see notes).

2) Afterburner operated at 1500°F.

3) Particulate, and THC (as $CH_4$) emissions were within P/CT No. 90511 allowables.

4) CO emissions during the first and third test runs were within P/CT No. 90511 allowable. CO emissions during the second test run exceeded P/CT No. 90511 by about 2%.

5) Subject afterburner THC destruction efficiency was approximately 99% i.e. greater then the 95% requirement.

6) Concentrations of CO and THC complied with September 18, 1988 Milton Polakovic policy for thermal afterburners.

CONCLUSION:

Compliance

RECOMMENDATIONS:

1) CRO should amend subject P/CT No. 90511/

2) Temporary certificate can be changed to permanent status pending approval by CRO.

c Milton Polakovic
Louis Mikolajczyk
Joe DePierro
Richelle Burkeen

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
Bureau of Technical Services
CN 411
Trenton, N.J. 08625-0411
(609) 530-4041

November 8,1990

MEMORANDUM

TO: Michael Pratt

FROM: Richelle Burkeen RSB

SUBJECT: Nestle Foods Corporation
Freehold, New Jersey
APC Plant ID. 20004
P/CT No. 090511
Log No. 01-891427A

On August 10, 1990, coffee roasters one, four, and five, in the above referenced facility, were tested for Particulates, Carbon Monoxide, and Total Hydrocarbons (as $CH_4$). The inlet was sampled for Total Hydrocarbons and the outlet was sampled for Particulates, Carbon Monoxide, and Total Hydrocarbon emissions. Air, Nova Inc., of Pennsauken, New Jersey performed these tests and the results are as follows.

| CONTAMINANT | Run No. 1 | Run No. 2 | Run No. 3 | Allowable |
|---|---|---|---|---|
| Particulates | | | | |
| LB/HR | 0.67 | 0.48 | 0.50 | 1.5* |
| Carbon Monoxide | | | | |
| ppm | 6 | 9 | 3 | 50** |
| LB/HR | 0.3 | 0.4 | 0.1 | 0.39* |
| Hydrocarbons | | | | |
| ppm | <1 | <1 | <1 | 25** |
| LB/HR | <0.02 | <0.02 | <0.02 | 0.077* |
| DRE | 99.21 | 99.25 | 99.31 | 95.00 |

* Obtained from form VEM-004 in the facility's file. Emission rates for coffee roasters one, two, and three were added to obtain this rate.

** Allowable as per Milton Polakovic's September 12, 1988 memo concerning allowable CO and THC concentrations from afterburners.

Technical Services calculations of the raw data indicates substantially the same results. The results indicate that hydrocarbon mass emission rate meets the 0.07 lb/hr allowable. The destruction efficiency of the total hydrocarbons was calculated to be approximately 99%. This is above the 95% minimum requirement.

The particulate mass emission rate allowable was 1.5 lb/hr for the three coffee roasters running simultaneously. All three test runs were below this emission rate.

The allowable mass emission rate for carbon monoxide was 0.39 lb/hr. Test runs one and three were within this rate, however test run number two exceeded the maximum allowable.

The percentage of $O_2$ in the outlet was found to be greater than 14%. Therefore, concentration emission rates for carbon monoxide and hydrocarbons are in compliance with the allowable rates as formulated in Milton Polakovic's policy dated 9/12/88 for thermal oxidizers.

The coffee roasters were natural gas fired and operated at a temperature range of 400-425 degrees Fahrenheit. The production rate of each of the three coffee roasters was 4150 lb/hour. According to Nestle Foods Corporation, testing of roasters one, four, and five reflects the worst case operating conditions, since no more than three roasters will operate at any given time. The regenerative afterburner operated at 1500 degrees Fahrenheit.

## 2.0 SITE DESCRIPTION

The source which was tested consisted of three (3) continuous coffee roasters, equipped with cyclone separators and a three (3) chamber regenerative afterburner. Five (5) coffee roasters were previously connected, however two (2) have been taken out of service. The coffee roasters are direct, natural gas fired. They operate in a temperature range of 400° -425°F. The production rates of the three (3) roasters are as follows:

| Roaster | Production Rate # lb/hr |
|---|---|
| 1 | 4150 |
| 2 | 4150 |
| 3 | 4150 |

The exhaust emission from the roasters are drawn through cyclone separators. Some of the exhaust from the cyclone separators is recirculated back to the coffee roasters.

The remaining exhaust gases are conveyed to a REECO three (3) chamber regenerative afterburner. The afterburner is operated at 1500°F with an exhaust flow rate of approximately 19,500 ACFM. The afterburner emissions are monitored for stack gas oxygen content and carbon monoxide content. A small fraction of the afterburner exhaust gases (approximately 500 ACFM) are recirculated back to the afterburner inlet. The remaining exhaust gases pass through a silencer into a ten (10) foot long tapered section with a divergence of approximately 14.8°. The diameter of the tapered section inlet is 26.5 inches, whereas the outlet diameter is 58 inches.

Filename: COFFEE7.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 1 | Stack temperature | Deg F | 337 | 330 | 331 | |
| ROASTER--AFTERBURNE INLET | Moisture | % | 11.5 | 12.3 | 12 | |
| | Oxygen | % | 19.7 | 19.7 | 19.7 | |
| | Volumetric flow, actual | acfm | 16221 | 16383 | 16544 | |
| | Volumetric flow, standard* | dscfm | 9525 | 9662 | 9730 | |
| | Isokinetic variation | % | | | | |
| Circle: Production or feed rate Capacity: | | TPH | 6.225 | 6.225 | 6.225 | |
| | Pollutant concentrations: | | | | | |
| | THC as methane | ppmdv | 141.4 | 135.8 | 146.7 | |
| | CO2 | % | 1 | 1 | 1 | |
| | Pollutant mass flux rates: | | | | | |
| | THC as methane | lb/hr | 3.36 | 3.28 | 3.57 | |
| | CO2 | lb/hr | 653 | 662 | 667 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | THC as methane | lb/ton | 0.541 | 0.527 | 0.573 | 0.547 |
| | CO2 | lb/ton | 105 | 106 | 107 | 106 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | THC as methane | kg/Mg | 0.270 | 0.263 | 0.286 | 0.273 |
| | CO2 | kg/Mg | 52.4 | 53.2 | 53.6 | 53.1 |

Filename: COFFEE7A.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 2 | Stack temperature | Deg F | 379 | 391 | 395 | |
| ROASTER--AFTERBURNE OUTLET | Moisture | % | 12.8 | 19 | 13.1 | |
| | Oxygen | % | 20.6 | 20.75 | 20.75 | |
| | Volumetric flow, actual | acfm | 19072 | 19349 | 18249 | |
| | Volumetric flow, standard* | dscfm | 10581 | 9835 | 9917 | |
| | Isokinetic variation | % | 103.3 | 109.2 | 110.2 | |
| Circle: Production or feed rate Capacity: | | TPH | 6.225 | 6.225 | 6.225 | |
| | Pollutant concentrations: | | | | | |
| | Filterable PM | G/acf | 0.00410 | 0.00286 | 0.00317 | |
| | THC as methane | ppmwv | 0.5 | 0.5 | 0.5 | |
| | CO | ppmdv | 6 | 9 | 3 | |
| | CO2 | % | 0.13 | 0.15 | 0.1 | |
| | Pollutant mass flux rates: | | | | | |
| | Filterable PM | lb/hr | 0.671 | 0.474 | 0.496 | |
| | THC as methane | lb/hr | 0.0238 | 0.0242 | 0.0228 | |
| | CO | lb/hr | 0.277 | 0.386 | 0.130 | |
| | CO2 | lb/hr | 94.3 | 101 | 68.0 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | Filterable PM | lb/ton | 0.108 | 0.0762 | 0.0797 | 0.0879 |
| | THC as methane | lb/ton | 0.00383 | 0.00388 | 0.00366 | 0.00379 |
| | CO | lb/ton | 0.0445 | 0.0620 | 0.0208 | 0.0425 |
| | CO2 | lb/ton | 15.1 | 16.2 | 10.9 | 14.1 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | Filterable PM | kg/Mg | 0.0539 | 0.0381 | 0.03983 | 0.0439 |
| | THC as methane | kg/Mg | 0.00191 | 0.001941 | 0.001831 | 0.00190 |
| | CO | kg/Mg | 0.0222 | 0.0310 | 0.0104 | 0.0212 |
| | CO2 | kg/Mg | 7.57 | 8.12 | 5.46 | 7.05 |

THC EMISSION FACTORS ARE BASED ON CONCENTRATIONS EQUAL TO 1/2 OF THE DETECTION LIMIT.

APPENDIX E

REFERENCE 8

# SOURCE TEST REPORT FOR PARTICULATE, VOLATILE ORGANIC COMPOUNDS AND CARBON MONOXIDE EMISSIONS

FROM THE

COFFEE ROASTER 7D AFTERBURNER

AT

GENERAL FOODS-MAXWELL HOUSE DIVISION
HOBOKEN, NEW JERSEY

APC PLANT I.D. NUMBER 10082
CERTIFICATE NUMBER 079136
N.J. STACK NUMBER 067

DECEMBER 20, 1990

Prepared For:

GENERAL FOODS-MAXWELL HOUSE DIVISION

Prepared By:

AIR CONSULTING AND ENGINEERING, INC.
2106 N.W. 67TH PLACE, SUITE 4
GAINESVILLE, FLORIDA 32606
(904) 335-1889

254-90-02

Table 1 Particulate Emission Summary
General Foods--Maxwell House Division
Roaster Number 7D Afterburner
Hoboken, New Jersey
December 20, 1990

| Run Number | Time | Volumetric Flow ACFM | Volumetric Flow SCFMD | Stack Temperature °F | Moisture Content % | Particulate Emissions gr/SCFD | Particulate Emissions lbs/Hr |
|---|---|---|---|---|---|---|---|
| 1 | 1228-1406 | 17422 | 3916 | 1510 | 18.6 | 0.0111 | 0.37 |
| 2 | 1521-1637 | 17046 | 3759 | 1516 | 19.9 | 0.0129 | 0.42 |
| 3 | 1750-1907 | 17173 | 3822 | 1520 | 19.0 | 0.0133 | 0.44 |
| AVERAGE | | 17214 | 3832 | 1515 | 19.2 | 0.0124 | 0.41 |

Allowable Emission = 0.50 lbs/Hr

Table 2 Volatile Organic Compound Emission Summary
General Foods--Maxwell House Division
Roaster Number 7D Afterburner
Hoboken, New Jersey
December 20, 1990

| Run Number | Time | Flow Rate SCFMD | Moisture Content % | Oxygen Content % | VOC's as Propane ppm Wet | VOC's as propane ppm Dry | VOC's as Methane ppm Dry | VOC's as Methane @ 7% O2 ppm Dry | VOC's as Methane lbs/Hr |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1200-1407 | 3916 | 18.6 | 11.4 | 0.53 | 0.65 | 1.95 | 2.85 | 0.019 |
| 2 | 1520-1638 | 3759 | 19.9 | 11.4 | 0.52 | 0.65 | 1.95 | 2.85 | 0.018 |
| 3 | 1750-1905 | 3822 | 19.0 | 11.4 | 0.64 | 0.79 | 2.37 | 3.47 | 0.023 |
| AVERAGE | | 3832 | 19.2 | 11.4 | 0.56 | 0.70 | 2.09 | 3.06 | 0.020 |

Allowable Emissions = 1.5 lb/Hr and 50 ppm @ 7% O2 (as Methane)

Flow and Moisture Data from concurrent particulate runs

O2% from concurrent EPA Method 3A runs

ppm dry = ppm wet/fraction dry air

ppm Methane by Carbon ratio of 3:1

MW Methane = 16

$lb/Hr = (2.595 \times 10^{-9})(MW)(ppm\ dry)(SCFMD)(60)$

O2 Correction

$$ppm\ dry\ @\ 7\%\ O2 = ppm\ dry \times \frac{20.9 - 7.0}{20.9 - \%O2}$$

## 3.0 PROCESS DESCRIPTION AND OPERATION

The Number 7D Coffee Roaster processes a 1200 lb batch of beans in approximately 15 minutes. This yields an average through put of 4800 lbs of beans per hour. Emissions from roasting (chaff, various oils, etc.) are conveyed by fan to the Number 7D Afterburner where they are incinerated at temperatures in excess of 1500°F and then exhausted to the atmosphere via a stack (See Section 4.0).

The Afterburner temperature is continuously monitored at the exit of the combustion chamber. The monitor print out and production verification data for the test period are presented in Appendix F.

Filename: COFFEE8.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 1 | Stack temperature | Deg F | 1510 | 1516 | 1520 | |
| ROASTER--AFTERBURNE OUTLET | Moisture | % | 18.6 | 19.9 | 19 | |
| | Oxygen | % | 11.4 | 11.4 | 11.4 | |
| | Volumetric flow, actual | acfm | 17422 | 17046 | 17173 | |
| | Volumetric flow, standard* | dscfm | 3916 | 3759 | 3822 | |
| | Isokinetic variation | % | 93.6 | 98.7 | 97 | |
| Circle: Production or feed rate Capacity: | | TPH | 2.398 | 2.399 | 2.405 | |
| | Pollutant concentrations: | | | | | |
| | Filterable PM | G/dscf | 0.0111 | 0.0129 | 0.0133 | |
| | THC as methane | ppmdv | 1.95 | 1.95 | 2.37 | |
| | CO | ppmdv | 64.5 | 77.5 | 61 | |
| | CO2 | % | 5.0 | 4.3 | 4.3 | |
| | Pollutant mass flux rates: | | | | | |
| | Filterable PM | lb/hr | 0.373 | 0.416 | 0.436 | |
| | THC as methane | lb/hr | 0.0191 | 0.0183 | 0.0226 | |
| | CO | lb/hr | 1.10 | 1.27 | 1.02 | |
| | CO2 | lb/hr | 1342 | 1108 | 1126 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | Filterable PM | lb/ton | 0.155 | 0.173 | 0.181 | 0.170 |
| | THC as methane | lb/ton | 0.00796 | 0.00763 | 0.00941 | 0.00833 |
| | CO | lb/ton | 0.459 | 0.530 | 0.423 | 0.471 |
| | CO2 | lb/ton | 560 | 462 | 468 | 497 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | Filterable PM | kg/Mg | 0.0777 | 0.0866 | 0.0906 | 0.0850 |
| | THC as methane | kg/Mg | 0.00398 | 0.00382 | 0.00471 | 0.00417 |
| | CO | kg/Mg | 0.230 | 0.265 | 0.211 | 0.235 |
| | CO2 | kg/Mg | 280 | 231 | 234 | 248 |

APPENDIX F

REFERENCE 9

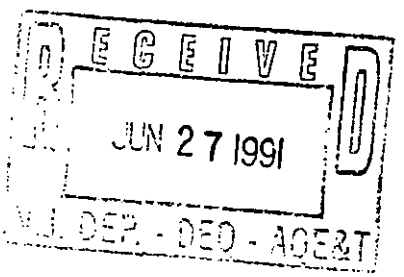
SOURCE TEST REPORT FOR
VOLATILE ORGANIC COMPOUNDS AND CARBON MONOXIDE EMISSIONS

FROM THE

COFFEE ROASTER 7D AFTERBURNER

AT

GENERAL FOODS-MAXWELL HOUSE DIVISION
HOBOKEN. NEW JERSEY




APC PLANT I.D. NUMBER 10082
CERTIFICATE NUMBER 079136
N.J. STACK NUMBER 067

MAY 9. 1991

Prepared For:

GENERAL FOODS-MAXWELL HOUSE DIVISION
1125 HUDSON STREET
HOBOKEN. NEW JERSEY 07030

Prepared By:

AIR CONSULTING AND ENGINEERING. INC.
2106 N.W. 67TH PLACE. SUITE 4
GAINESVILLE. FLORIDA 32606
(904) 335-1889

254-91-02

Table 1 Emission Summary - Bag Samples
General Foods-Maxwell House Division
Roaster 7D Afterburner
Hoboken, New Jersey
May 9, 1991

| Run Number | Time | Flow Rate SCFMD | Oxygen % | CO Emissions ppm dry | CO Emissions ppm dry @ 7% $O_2$ | CO Emissions lbs/Hr | VOC Emissions ppm wet as propane | VOC Emissions ppm dry as propane | VOC Emissions ppm dry as methane | VOC Emissions ppm dry @ 7% O2 as methane | VOC Emissions lbs/hr as methane |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1* | 0950-1054 | 3378 | 11.5 | 21.8 | 32.24 | 0.32 | 0.0 | 0.00 | 0.00 | 0.00 | 0.000 |
| 2 | 1140-1244 | 2907 | 11.8 | 33.6 | 51.32 | 0.43 | 0.3 | 0.43 | 1.29 | 1.97 | 0.009 |
| 3 | 1331-1435 | 2786 | 11.3 | 43.2 | 62.55 | 0.52 | 0.8 | 1.16 | 3.48 | 5.04 | 0.024 |
| 4 | 1521-1632 | 2901 | 11.7 | 32.9 | 49.71 | 0.42 | 0.6 | 0.84 | 2.52 | 3.81 | 0.018 |
| AVERAGE | --- | 2865 | 11.6 | 36.6 | 54.53 | 0.46 | 0.6 | 0.81 | 2.43 | 3.61 | 0.017 |

VOID

*Run 1 is not included in the averages because of problems with the sampling train.

ppm dry @ 7% $O_2$ = (ppm dry) $\frac{20.9 - 7\%}{20.9 - \%O_2}$

lbs/Hr = ppm ($2.595 \times 10^{-9}$) MW (SCFMD) 60, MW CO = 28, $MWCH_4$ = 16

VOC ppm dry = ppm wet/fraction of dry air

ppm methane by carbon ration 3:1

Allowable Emissions

CO = 1.5 lbs/Hr and 100 ppm @ 7% $O_2$
VOC = 1.5 lbs/hr and 50 ppm @ 7% $O_2$ as methane

## 3.0 PROCESS DESCRIPTION AND OPERATION

The Number 7D Coffee Roaster processes a 1200 lb batch of beans in approximately 15 minutes. This yields an average through put of 4800 lbs of beans per hour. Emissions from roasting (chaff, various oils, etc.) are conveyed by fan to the Number 7D Afterburner where they are incinerated at temperatures in excess of 1500°F and then exhausted to the atmosphere via a stack (See Section 4.0).

The Afterburner temperature is continuously monitored at the exit of the combustion chamber. The monitor print out and production verification data for the test period are presented in Appendix E.

Filename: COFFEE9.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 2 | Run 3 | Run 4 | AVG. |
| 1 | Stack temperature | Deg F | 1593 | 1590 | 1586 | |
| ROASTER--AFTERBURNE OUTLET | Moisture | % | 29.9 | 30.9 | 28.7 | |
| | Oxygen | % | 11.8 | 11.3 | 11.7 | |
| | Volumetric flow, actual | acfm | 16076 | 15612 | 15716 | |
| | Volumetric flow, standard* | dscfm | 2907 | 2786 | 2901 | |
| | Isokinetic variation | % | NA | NA | NA | |
| Circle: Production or feed rate Capacity: | | TPH | 2.401 | 2.399 | 2.400 | |
| | Pollutant concentrations: | | | | | |
| | THC as methane | ppmdv | 1.29 | 3.48 | 2.52 | |
| | CO | ppmdv | 33.6 | 43.2 | 32.9 | |
| | Pollutant mass flux rates: | | | | | |
| | THC as methane | lb/hr | 0.00937 | 0.0242 | 0.0183 | |
| | CO | lb/hr | 0.426 | 0.525 | 0.416 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | THC as methane | lb/ton | 0.00390 | 0.01010 | 0.00761 | 0.00720 |
| | CO | lb/ton | 0.177 | 0.219 | 0.173 | 0.190 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | THC as methane | kg/Mg | 0.00195 | 0.00505 | 0.00380 | 0.00360 |
| | CO | kg/Mg | 0.0887 | 0.109 | 0.0867 | 0.0950 |

APPENDIX G

REFERENCE 11

# AirNova, Inc.

AIR QUALITY SAMPLING AND ANALYSIS

[illegible], Supervisor
sultant Test Program, Bureau of Technica

itta Inc. - Cherry Hill, New Jersey
ck Emission Test Program
Plant ID No. 50365
Stack No. 019
T No. 091277
No. 01-88-5476

(609) 486-1500
5845-A Clayton Avenue
Pennsauken, New Jersey 08109

State of New Jersey
Department of Environmental Protection and Energy
Air Quality Regulation Program
CN 027
Trenton, NJ 08625-0027

Scott A. Weiner
*Commissioner*

William O'Sullivan, P.E.
*Administrator*

May 7, 1992

MEMORANDUM

TO: Scott Hawthorne, Regional Enforcement Officer
Southern Regional Enforcement Office

FROM: Michael A. Klein, Supervisor
Consultant Test Program, Bureau of Technical Services

SUBJECT: Melitta Inc. - Cherry Hill, New Jersey
Stack Emission Test Program
APC Plant ID No. 50365
NJ Stack No. 019
P/CT No. 091277
Log No. 01-88-5476

Stack emission tests were conducted at the above referenced facility on January 7, 1992. The purpose of the tests was to quantify the emissions of particulate, total hydrocarbons (THC) and carbon monoxide (CO) being emitted to the atmosphere from the "O2 afterburner". In addition, the destruction efficiency for THC was determined during the test program. The test results were then compared to the allowable limits specified by the permit/certificate (P/CT).

Len Sobolewski reviewed the submitted stack test report. His review indicated particulate emissions during Run No. 3 and CO emissions for all three runs exceeded the emission limits specified in the P/CT. The CO concentrations at 7% oxygen were also in excess of the afterburner policy limit of 100 ppmv. THC emissions were in compliance with the P/CT emission limits and the afterburner policy concentration limit of 50 ppmv at 7% oxygen.

Additionally, the company failed to meet the required destruction efficiency of 95% for all three runs.

Based on the reported emissions, appropriate enforcement action is recommended for the particulate and CO emission exceedances, as well as for the insufficient destruction efficiency.

c Chief Mikolajczyk
Chief Polakovic
Chief Held
Len Sobolewski

## Production Rates

The following production operating conditions during the testing project was reported by Walter Beland, *Southern Regional Office* and Mr. John Thoden, Maintenance Supervisor, Melitta USA., Inc.

The 02 Afterburner was operating at 1500°F during the entire testing period as specified by the Permit operating conditions

The Permit/Certificate lists the production of coffee beans at 540 lbs/batch @ 3.5 batches/hr. This results in a roasting rate of 1890 lbs/hr.

During the number 1 shift 14,880 pounds of coffee beans were roasted and during the number 2 shift 8,640 pounds of coffee beans were roasted (1860 and 1080 avg lbs/hr).

Technical Services calculations of the raw field data and the reported results of the laboratory analysis submitted indicated the same results as reported by Air Nova, Inc.

The test results indicated that the particulate(lbs/hr) emissions for run numbers one and two were within the standards and exceeded the Permit/Certificate standards during run number three .

The test results indicated that the total hydrocarbons destruction efficiency did not meet the Permit/Certificate 95% requirement during the test runs.

The test results indicated that the total hydrocarbon (lbs/hr) emissions were within the standards stated on the Permit/Certificate during all test runs. In addition the PPM @ 7% $O_2$ requirement by the Deparment was also standard for all test runs.

The test results indicated that the carbon monoxide (lbs/hr) emissions exceeded the standards stated on the Permit/Certificate during all test runs.

The test results indicated that the carbon monoxide (PPM @ 7% $O_2$) Department requirement was exceeded during all test runs.

## 2.0 SITE INFORMATION

The emission control device under evaluation is a Thermal-Burns Model 36R afterburner. The afterburner operates at a combustion chamber temperature of 1500°F with a minimum residence time of 0.5 second. The Thermal-Burns services a Blaw Knox coffee roaster controlling hydrocarbon emissions from the batch process.

Outlet emission sampling was conducted in a vertical section of 32-inch ID exhaust ducting with sample ports situated at 90° apart and located 4 duct diameters downstream and 1 duct diameter upstream from the nearest flow disturbance.

Inlet sampling was conducted in a section of 17 inch ID horizontal ducting located 6 duct diameters downstream and 1 duct diameter upstream from the nearest flow disturbance. Two sample ports situated 90° apart were utilized for all sampling.

A schematic diagram of the emission control system is presented in Figure 2-1.

**AirNova, Inc.**
5845-A Clayton Avenue, Pennsauken, New Jersey 08109
(609) 486-1500 • FAX 486-9896

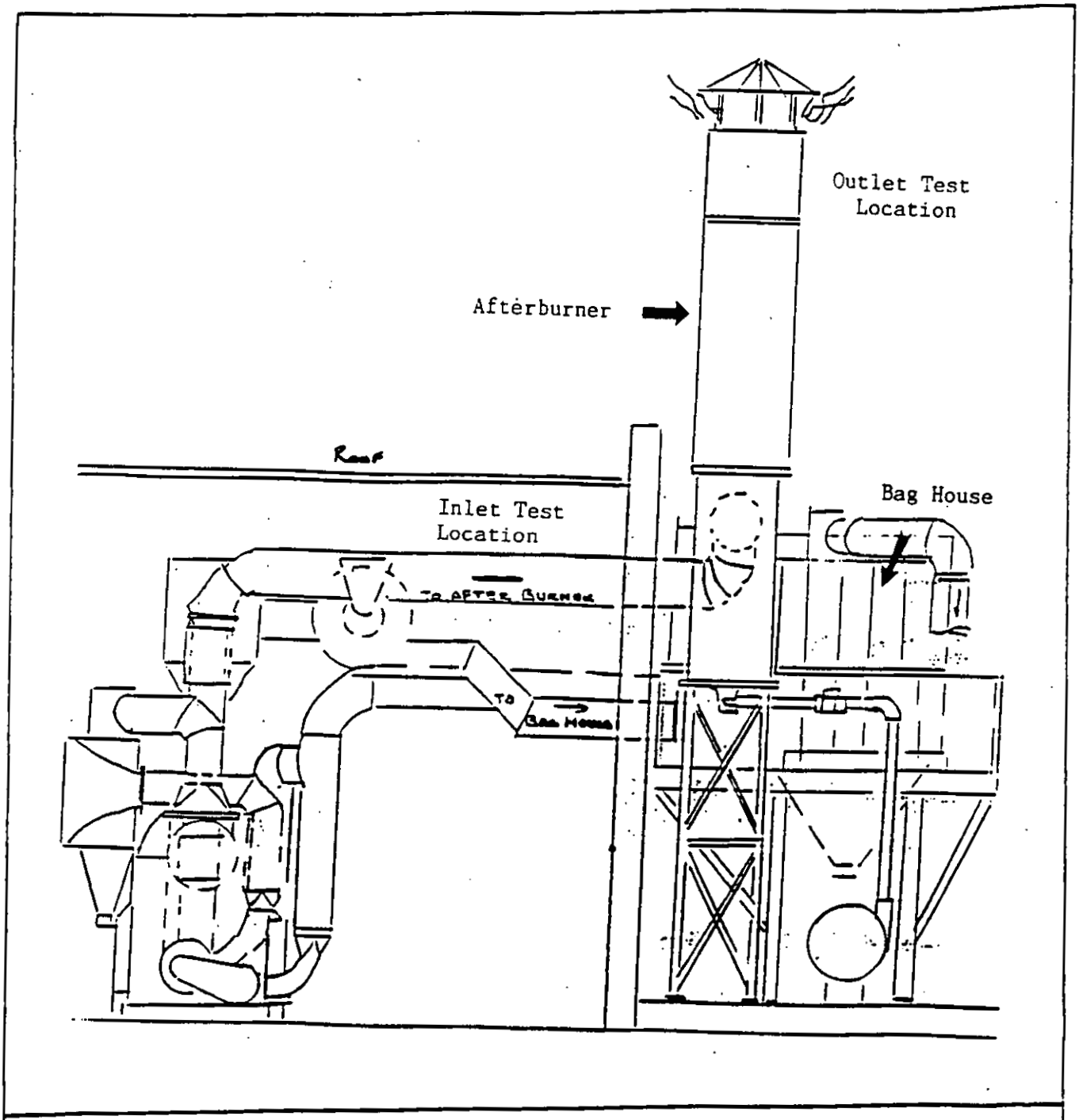



Figure 2-1 Blaw Knox Coffee Roaster– Thermal-Burns Model 36R Afterburner

## 3.0 TEST RESULTS

The results of the test program are presented in this section. Summary tables are presented as follows:



The average particulate emission rate for the three test runs was determined to be 0.03 lb/hr. Carbon monoxide emissions are limited to 100 ppmV-dry at 7% oxygen. The average carbon monoxide concentration was determined to be 166 ppmV-dry at 7% oxygen. Actual carbon monoxide emissions were somewhat higher than reported as periodic concentration excursions exceeded the measurement system upper range of 1000 ppmV-dry. The average total hydrocarbon destruction efficiency was determination to be 89.84% which is below the required 95%. Outlet total hydrocarbon emissions averaged 0.07 lb/hr.

Table 3-1

Particulate Emission Summary
Melitta USA, Inc.

| Run No. | 1 | 2 | 3 |
|---|---|---|---|
| Date | 01/07/92 | 01/07/92 | 01/07/92 |
| Test Period | 1012-1150 | 1230-1335 | 1412-1515 |
| Temperature (°F) | 1165 | 1216 | 1173 |
| Moisture Content (%) | 17.4 | 15.3 | 16.7 |
| Molecular Wt. (lb/mole) | 27.25 | 27.47 | 27.34 |
| Velocity (FPM) | 890 | 1,040 | 1,010 |
| Flow Rate (DSCFM) | 1,347 | 1,564 | 1,533 |
| Isokinetic Rate (%) | 109 | 102 | 108 |
| Oxygen (%) | 13.28 | 13.60 | 13.35 |
| Carbon Dioxide (%) | 4.14 | 3.93 | 4.23 |
| Carbon Monoxide (%) | 0.00 | 0.00 | 0.00 |
| Particulate | | | |
| Concentration (gr/DSCF-dry) | 0.001 | 0.002 | 0.006 |
| Emission Rate (lb/hr) | 0.01 | 0.02 | 0.07 |

Standard Conditions: 70°F, 29.92 in Hg

Table 3-2

Total Hydrocarbon Emission Summary
Melitta USA, Inc.

| Run No. | 1 | | 2 | | 3 | |
|---|---|---|---|---|---|---|
| Location | Inlet | Outlet | Inlet | Outlet | Inlet | Outlet |
| Concentration * (ppmV-dry) | 433 | 25.1 | 344 | 14.0 | 369 | 15.5 |
| Emission Rate (lb/hr) | 0.94 | 0.08 | 0.49 | 0.06 | 0.56 | 0.06 |
| Removal Efficiency (%) | 91.07 | | 88.88 | | 89.57 | |

* All concentrations are expressed as methane

Standard 70°F, 29.92 in Hg.

Filename: COFFEE11.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 1 | Stack temperature | Deg F | 500 | 661 | 665 | |
| ROASTER--AFTERBURNE INLET | Moisture | % | 17.9 | 18.1 | 18.1 | |
| | Oxygen | % | 16.5 | 14.8 | 15.1 | |
| | Volumetric flow, actual | acfm | ND | ND | ND | |
| | Volumetric flow, standard* | dscfm | 873 | 575 | 607 | |
| | Isokinetic variation | % | NA | NA | NA | |
| Circle: Production or feed rate Capacity: | | TPH | 0.93 | 0.93 | 0.54 | |
| | Pollutant concentrations: | | | | | |
| | THC as methane | ppmdv | 433 | 344 | 369 | |
| | CO2 | % vol. | 2.3 | 3.3 | 3.3 | |
| | Pollutant mass flux rates: | | | | | |
| | THC as methane | lb/hr | 0.944 | 0.494 | 0.560 | |
| | CO2 | lb/hr | 138 | 130 | 137 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | THC as methane | lb/ton | 1.02 | 0.531 | 1.04 | 0.861 |
| | CO2 | lb/ton | 148 | 140 | 254 | 181 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | THC as methane | kg/Mg | 0.508 | 0.266 | 0.518 | 0.430 |
| | CO2 | kg/Mg | 74.0 | 69.9 | 127 | 90.3 |

Filename: COFFE11A.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 2 | Stack temperature | Deg F | 1165 | 1216 | 1173 | |
| ROASTER--AFTERBURNE OUTLET | Moisture | % | 17.4 | 15.3 | 16.7 | |
| | Oxygen | % | 13.3 | 13.6 | 13.4 | |
| | Volumetric flow, actual | acfm | ND | ND | ND | |
| | Volumetric flow, standard* | dscfm | 1347 | 1564 | 1533 | |
| | Isokinetic variation | % | 109 | 102 | 108 | |
| Circle: Production or feed rate Capacity: | | TPH | 0.93 | 0.93 | 0.54 | |
| | Pollutant concentrations: | | | | | |
| | Filterable PM | G/dscf | 0.001 | 0.002 | 0.006 | |
| | THC as methane | ppmdv | 25.1 | 14 | 15.5 | |
| | CO | ppmdv | 90.6 | 84.8 | 92.1 | |
| | CO2 | % | 4.14 | 3.93 | 4.23 | |
| | Pollutant mass flux rates: | | | | | |
| | Filterable PM | lb/hr | 0.0115 | 0.0268 | 0.0788 | |
| | THC as methane | lb/hr | 0.0845 | 0.0547 | 0.0594 | |
| | CO | lb/hr | 0.532 | 0.579 | 0.616 | |
| | CO2 | lb/hr | 382 | 421 | 444 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | Filterable PM | lb/ton | 0.0124 | 0.0288 | 0.146 | 0.0624 |
| | THC as methane | lb/ton | 0.0908 | 0.0588 | 0.1099 | 0.0865 |
| | CO | lb/ton | 0.572 | 0.622 | 1.14 | 0.778 |
| | CO2 | lb/ton | 411 | 453 | 823 | 562 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | Filterable PM | kg/Mg | 0.00621 | 0.0144 | 0.0730 | 0.0312 |
| | THC as methane | kg/Mg | 0.0454 | 0.0294 | 0.0550 | 0.0433 |
| | CO | kg/Mg | 0.286 | 0.311 | 0.570 | 0.389 |
| | CO2 | kg/Mg | 205 | 226 | 411 | 281 |

APPENDIX H

REFERENCE 12

(#12)

**NESTLE BEVERAGE CO.**

**Source Test Report**
**Coffee Roaster & Cooler**
**Test Date: September 18, 1992**

**BEST ENVIRONMENTAL, INC.**
15890 Foothill Boulevard
San Leandro, California 94578
**(510) 278-4011 FAX (510) 278-4018**

October 1, 1992

AKTON ASSOCIATES
737 Arnold Drive, Ste. E
Martinez, CA 94553

P/T #2607

**Attn:** Mr. Frank Pizzimenti

Subject: **Compliance emission evaluation of the thermal-catalytic oxidizer, serving the new continuous coffee roaster, and the coffee cooler at Nestle Beverage Company, Union City, CA.**

Test Date: September 18, 1992.

Sampling Location: Sampling for total non-methane hydrocarbons (TNMHC) was conducted at the inlet and outlet of the oxidizer, which serves the coffee roaster. Emissions of total filterable particulate matter (PM) were measured at the outlet of the oxidizer, as well as from the coffee cooler. Exhaust gas volumetric flow rates were measured at the inlet and outlet of the oxidizer and the outlet of the coffee cooler. Moisture content of the gas streams were monitored at the inlet to the oxidizer and at the oxidizer and cooler outlet locations.

Sampling Personnel: Sampling was performed by Guy Worthington, Dan Cartner, Michael Wiley and Marshall Ness of BEST ENVIRONMENTAL INC.

Observing Personnel: Chuck McClure, Bob Bartley and Hiroshi Doi of the Bay Area Air Quality Management District (BAAQMD) were present to witness the progress of the test.

Process Description: The thermal-catalytic oxidizer is used as a control device for volatile organic emissions from the new continuous coffee roaster. The control efficiency of the oxidizer was tested at an operating temperature of approximately 772°F, although the set point was 750°F. During the test program green beans were being processed at a rate of 8,500 lbs/hr.

Test Program: Triplicate tests for total non-methane hydrocarbon destruction efficiency were performed, plus triplicate particulate tests from the coffee roaster and coffee cooler.

The oxidizer inlet was monitored for total non-methane hydrocarbons (TNMHC), using the Bay Area Air Quality Management District (BAAQMD) combustion procedure, Method ST-7. The outlet (TNMHC) were measured using a FID hydrocarbon analyzer. The outlet was also monitored continuously for carbon monoxide (CO), carbon dioxide ($CO_2$) and oxygen ($O_2$). Inlet concentrations of $O_2$, CO and methane ($CH_4$) were measured from integrated bag samples.

The stack gas volumetric flowrate was measured at the inlet using BAAQMD Method ST-17, ST-18. The coffee roaster and coffee cooler stack gas moisture and flowrates, were calculated from CARB Method 5 test data.

Sampling and Analysis Methods: The following Bay Area Air Quality Management District (BAAQMD) and California Air Resources Board (CARB), sampling and analytical methods were used:

| | |
|---|---|
| BAAQMD Method ST-5 | Carbon Dioxide, continuous monitoring |
| BAAQMD Method ST-6 | Carbon Monoxide, continuous monitoring |
| BAAQMD Method ST-7 | TNMHC, continuous monitoring |
| BAAQMD Method ST-14 | Oxygen, continuous monitoring |
| BAAQMD Method ST-13A | Oxides of Nitrogen, continuous monitoring |
| BAAQMD Method ST-17 & 18 | Volumetric Flowrate |
| BAAQMD Method ST-23 | Moisture Content |

Instrumentation: The following continuous emission analyzers were used:

| | |
|---|---|
| $THC/CH_4$ | Combustion Engineering FID Total Hydrocarbon Analyzer |
| CO | TECO Model 48 GFC Carbon Monoxide Analyzer |
| $CO_2$% | Horiba PIR-2000 |
| $CO_2$ppm | Horiba PIR-2000 |
| NOx ppm | TECO Model 10 |
| $O_2$ | Teledyne Model 326A Oxygen Analyzer |

Test Results: Emission and efficiency results are presented in the following three tables. The [redacted] The results from Test #1 have been excluded from the average, because contamination of the probe and nozzle rinse portion is strongly indicated. The filter portion of Test #1 is comparable with Tests #2 and #3. Particulate emissions from the coffee cooler averaged 0.0017 gr/dscf, 0.118 lbs/hr.

Stack gas volumetric flowrate calculations, all emission calculations, field data sheets, laboratory reports, strip charts and calibration gas certifications are appended to this report.

If you have any questions regarding this report, or if BEST ENVIRONMENTAL can be of any further assistance, please call.

Submitted by

Guy Worthington
Project Manager

Reviewed by

Regan Best
Manager

## TABLE 1

### Nestle's, Union City
### CARB Method 5 Particulate Results

Unit #: Coffee cooler outlet
Conditions: Normal

| TEST # | 1 | 2 | 3 | AVERAGE |
|---|---|---|---|---|
| Test Date | 9/18/92 | 9/18/92 | 9/18/92 | |
| Test Time | 1105-1206 | 1302-1404 | 1436-1540 | |
| Sample Volume (SDCF) | [illegible] | [illegible] | [illegible] | |
| Stack Gas Oxygen, % | 20.9 | 20.9 | 20.9 | 20.9 |
| Stack Gas Carbon Dioxide, % | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Sample Wt.. (mg) | 5.6 | 3.5 | 5.8 | 5.0 |
| Velocity (ft/sec) | 38.29 | 37.81 | 37.99 | 38.03 |
| Isokinetic (%) | [illegible] | [illegible] | [illegible] | [illegible] |
| Stack Temp. (degrees F) | 120.3 | 122.8 | 122.4 | 121.8 |
| Flowrate (SDCFM) | [illegible] | [illegible] | [illegible] | [illegible] |
| Flowrate (ACFM) | 9,824 | 9,702 | 9,746 | 9,757 |
| H20 (volume %) | 6.0 | 6.5 | 5.8 | 6.1 |
| Particulate Conc. (gr/dscf) | [illegible] | [illegible] | [illegible] | [illegible] |
| Particulate Emissions (lbs/hr) | [illegible] | [illegible] | [illegible] | [illegible] |

WHERE,

Sample Volume = Standard dry cubic feet
Sample Weight = Total filterable particulate
Temperature = Degrees fahrenheit
Velocity = Stack gas velocity in feet per second
SDCFM = Standard dry cubic feet per minute
ACFM = Actual cubic feet per minute
H2O, volume % = Stack gas percent water vapor
gr/dscf = Concentration in grains per SDCF
lbs/hr = Emission rate in pounds per hour

CALCULATIONS,

Concentration, gr/dscf = 0.01543 gr/mg* Sample Wt.mg/ Sample Volume(SDCF)
Emissions, lbs/hr = ((Sample Wt.mg/453,600mg/lb)/Sample Vol(SDCF))*SDCFM*60min/hr

COFFEE COOLER S-28 PERMIT COND # 6853

PM10 (S-28 + S-32 COMBINED) ≤ 18 LB/DAY OK!

TEST EITHER S-28 OR S-32 SO 0.118 X 2 X 24 = 5.66 LB/DAY

TABLE 2

## Nestle's, Union City

### CARB Method 5 Particulate Results

Unit #: Coffee Roaster - Outlet

Conditions: Normal

| TEST # | 1 | 2 | 3 | AVERAGE Runs 2 & 3 |
|---|---|---|---|---|
| Test Date | 9/18/92 | 9/18/92 | 9/18/92 | |
| Test Time | 1108-1212 | 1305-1408 | 1454-1600 | |
| Sample Volume (SDCF) | 28.134 | 25.911 | 25.321 | |
| Stack Gas Oxygen, % | 16.0 | 16.0 | 16.0 | 16.0 |
| Stack Gas Carbon Dioxide, % | 2.9 | 2.9 | 2.9 | 2.9 |
| Total Sample Wt.. (mg) | 240.0 | 28.2 | 32.9 | 30.6 |
| Velocity (ft/sec) | 36.30 | 36.19 | 34.67 | 35.43 |
| Isokinetic (%) | 109.8 | 103.8 | 107.1 | 105.4 |
| Stack Temp. (degrees F) | 674.0 | 698.8 | 685.0 | 691.9 |
| Flowrate (SDCFM) | 5,520 | 5,381 | 5,096 | 5,238 |
| Flowrate (ACFM) | 13,732 | 13,690 | 13,117 | 13,404 |
| H20 (volume %) | 14.0 | 14.1 | 16.1 | 15.1 |
| Particulate Conc. (gr/dscf) | 0.1316 | 0.0168 | 0.0200 | 0.0184 |
| Particulate Emissions (lbs/hr) | 6.227 | 0.774 | 0.876 | 0.825 |

HIGH

WHERE,

Sample Volume = Standard dry cubic feet
Sample Weight = Total filterable particulate
Temperature = Degrees fahrenheit
Velocity = Stack gas velocity in feet per second
SDCFM = Standard dry cubic feet per minute
ACFM = Actual cubic feet per minute
H2O, volume % = Stack gas percent water vapor
gr/dscf = Concentration in grains per SDCF
lbs/hr = Emission rate in pounds per hour

CALCULATIONS,

Concentration, gr/dscf = 0.01543 gr/mg* Sample Wt.mg/ Sample Volume(SDCF)
Emissions, lbs/hr = ((Sample Wt.mg/453,600mg/lb)/Sample Vol(SDCF))*SDCFM*60min/hr

## TABLE 3

# NESTLE

### TNMHC Destruction Efficiency Test Results

Unit: Coffee Roaster
Operating Condition: Afterburner 772 °F

| TEST | 1 | | 2 | | 3 | | AVERAGE | |
|---|---|---|---|---|---|---|---|---|
| Location | Inlet | Outlet | Inlet | Outlet | Inlet | Outlet | Inlet | Outlet |
| Test Time | 1105-1130 | | 1200-1230 | | 1245-1330 | | | |
| Test Date | 9-18-92 | | 9-18-92 | | 9-18-92 | | | |
| Flowrate, SDCFM | 5,077 | 5,332 | 5,077 | 5,332 | 5,077 | 5,332 | 5,077 | 5,332 |
| H2O, % | 10.0 | 14.7 | 10.0 | 14.7 | 10.0 | 14.7 | 10.0 | 14.7 |
| O2, % | 17.8 | 16.1 | 17.8 | 16.0 | 17.5 | 16.0 | 17.7 | 16.0 |
| CO2, ppm, (%) | 16,800 | (2.9) | 16,560 | (2.85) | 16,680 | (2.85) | 16,680 | (2.5) |
| CO, ppm | 305.0 | 9.9 | 360.0 | 11.5 | 348.0 | 11.5 | 337.7 | 11.0 |
| CH4, ppm | 158.0 | 96.0 | 157.0 | 102.0 | 151.0 | 97.2 | 155.3 | 98.4 |
| THC, ppm | N.A. | 103.2 | N.A. | 104.0 | N.A. | 100.1 | N.A. | 102.4 |
| TOC, ppm | 18,000 | N.A. | 17,820 | N.A. | 17,664 | N.A. | 17,828 | N.A. |
| TNMHC, ppm | 1,200 | 7.2 | 1,260 | 2.0 | 984 | 2.9 | 1,148 | 4.0 |
| TNMHC, #/hr as CH4 | 15.2 | 0.096 | 16.0 | 0.027 | 12.5 | 0.039 | 14.5 | 0.054 |
| TNMHC Control Efficiency, % | | 99.37 | | 99.83 | | 99.69 | | 99.63 |

WHERE,
- CO = Carbon Monoxide
- CO2 = Carbon Dioxide
- THC = Total Hydrocarbons as CH4
- TOC = Total Oxidizable Carbon
- TNMHC = Total non -Methane Hydrocarbons as CH4 (MW=16)
  - = THC - CH4, or TOC - CO2 - CO - CH4
- N.A. = Not Applicable
- N.D. = Not Determined
- ppm = Parts Per Million Concentration
- lbs/hr = Pounds Per Hour Emission Rate
- Flowrate, SDCFM = Standard Dry Cubic Feet Per Minute
- CH4 = Methane
- < = Less Than (Detection Limit Reported)
- 0 = Not Detected; CH4 < 1.0 ppm, CO < 1.0 ppm, NOx < 1.0 ppm

Calculations,

Emission Rate, lbs/hr = ppm x MW x SDCFM x 1.56 x 10E-7

Efficiency, % = (inlet #/hr - outlet #/hr) / inlet #/hr

Filename: COFFEE12.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 1 | Stack temperature | Deg F | 120.3 | 122.8 | 122.4 | |
| COFFEE COOLER OUTLET | Moisture | % | 6 | 6.5 | 5.8 | |
| | Oxygen | % | 20.9 | 20.9 | 20.9 | |
| | Volumetric flow, actual | acfm | 9824 | 9702 | 9746 | |
| | Volumetric flow, standard* | dscfm | 8438 | 8252 | 8358 | |
| | Isokinetic variation | % | 97 | 98.4 | 94.9 | |
| Circle: Production or feed rate Capacity: | | TPH | 4.25 | 4.25 | 4.25 | |
| | Pollutant concentrations: | | | | | |
| | Filterable PM | G/dscf | 0.0018 | 0.0012 | 0.0020 | |
| | Pollutant mass flux rates: | | | | | |
| | Filterable PM | lb/hr | 0.1330 | 0.0820 | 0.1410 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | Filterable PM | lb/ton | 0.0313 | 0.0193 | 0.0332 | 0.0279 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | Filterable PM | kg/Mg | 0.0156 | 0.00965 | 0.0166 | 0.0140 |

FILTERABLE PM = TOTAL PM FOR THIS SOURCE

Filename: COFFE12A.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 2 | Stack temperature | Deg F | ND | ND | ND | |
| ROASTER--AFTERBURNE INLET | Moisture | % | 10 | 10 | 10 | |
| | Oxygen | % | 17.8 | 17.8 | 17.5 | |
| | Volumetric flow, actual | acfm | ND | ND | ND | |
| | Volumetric flow, standard* | dscfm | 5077 | 5077 | 5077 | |
| | Isokinetic variation | % | NA | NA | NA | |
| Circle: Production or feed rate Capacity: | | TPH | 4.25 | 4.25 | 4.25 | |
| | Pollutant concentrations: | | | | | |
| | TNMHC as methane | ppmdv | 737 | 743 | 485 | |
| | Methane | ppmdv | 158 | 157 | 151 | |
| | CO | ppmdv | 305 | 360 | 348 | |
| | CO2 | ppmdv | 16800 | 16560 | 16680 | |
| | Pollutant mass flux rates: | | | | | |
| | TNMHC as methane | lb/hr | 9.35 | 9.42 | 6.15 | |
| | Methane | lb/hr | 2.00 | 1.99 | 1.91 | |
| | CO | lb/hr | 6.75 | 7.97 | 7.71 | |
| | CO2 | lb/hr | 585 | 576 | 580 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | TNMHC as methane | lb/ton | 2.20 | 2.22 | 1.45 | 1.95 |
| | Methane | lb/ton | 0.470 | 0.467 | 0.449 | 0.462 |
| | TOC as methane | lb/ton | 2.67 | 2.68 | 1.90 | 2.42 |
| | CO | lb/ton | 1.59 | 1.88 | 1.81 | 1.76 |
| | CO2 | lb/ton | 138 | 136 | 137 | 137 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | TNMHC as methane | kg/Mg | 1.10 | 1.11 | 0.724 | 0.977 |
| | Methane | kg/Mg | 0.235 | 0.234 | 0.225 | 0.231 |
| | TOC as methane | kg/Mg | 1.33 | 1.34 | 0.95 | 1.21 |
| | CO | kg/Mg | 0.795 | 0.938 | 0.907 | 0.880 |
| | CO2 | kg/Mg | 68.8 | 67.8 | 68.3 | 68.3 |

Filename: COFFE12B.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 3 | Stack temperature | Deg F | 674 | 698.8 | 685 | |
| ROASTER--AFTERBURNE OUTLET | Moisture | % | 14 | 14.1 | 16.1 | |
| | Oxygen | % | 16 | 16 | 16 | |
| | Volumetric flow, actual | acfm | 13732 | 13690 | 13117 | |
| | Volumetric flow, standard* | dscfm | 5520 | 5381 | 5096 | |
| | Isokinetic variation | % | 109.8 | 103.8 | 107.1 | |
| Circle: Production or feed rate Capacity: | | TPH | 4.25 | 4.25 | 4.25 | |
| | Pollutant concentrations: | | | | | |
| | Filterable PM | G/dscf | 0.1246 | 0.0079 | 0.0106 | |
| | Condensible PM | G/dscf | 0.0071 | 0.0089 | 0.00945 | |
| | TNMHC as methane | ppmdv | 7.2 | 2 | 2.9 | |
| | Methane | ppmdv | 96 | 102 | 97.2 | |
| | CO | ppmdv | 9.9 | 11.5 | 11.5 | |
| | CO2 | % | 2.9 | 2.9 | 2.9 | |
| | Pollutant mass flux rates: | | | | | |
| | Filterable PM | lb/hr | 5.90 | 0.374 | 0.502 | |
| | Condensible PM | lb/hr | 0.336 | 0.421 | 0.447 | |
| | TNMHC as methane | lb/hr | 0.0993 | 0.0269 | 0.0369 | |
| | Methane | lb/hr | 1.32 | 1.37 | 1.24 | |
| | CO | lb/hr | 0.238 | 0.270 | 0.256 | |
| | CO2 | lb/hr | 1097 | 1069 | 1013 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | Filterable PM | lb/ton | VOID | 0.0879 | 0.118 | 0.103 |
| | Condensible PM | lb/ton | VOID | 0.0991 | 0.105 | 0.102 |
| | TNMHC as methane | lb/ton | 0.0234 | 0.00633 | 0.00869 | 0.0128 |
| | Methane | lb/ton | 0.311 | 0.323 | 0.291 | 0.308 |
| | TOC as methane | lb/ton | 0.335 | 0.329 | 0.300 | 0.321 |
| | CO | lb/ton | 0.0561 | 0.0635 | 0.0601 | 0.0599 |
| | CO2 | lb/ton | 258 | 252 | 238 | 249 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | Filterable PM | kg/Mg | VOID | 0.0440 | 0.0590 | 0.0515 |
| | Condensible PM | kg/Mg | VOID | 0.0495 | 0.0526 | 0.0511 |
| | TNMHC as methane | kg/Mg | 0.0117 | 0.00316 | 0.00434 | 0.00640 |
| | Methane | kg/Mg | 0.156 | 0.161 | 0.146 | 0.154 |
| | TOC as methane | kg/Mg | 0.167 | 0.164 | 0.150 | 0.161 |
| | CO | kg/Mg | 0.0280 | 0.0318 | 0.0301 | 0.0300 |
| | CO2 | kg/Mg | 129 | 126 | 119 | 125 |

Run 1 for PM is VOID

APPENDIX I

REFERENCE 13

#13

DISTRIBUTION:
Firm
Permit Services
Enforcement
Technical Services
Source Inventory
Planning
Requester
DAPCO

BAY AREA
AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street
San Francisco, California 94109
(415) 771-6000

# SUMMARY OF SOURCE TEST RESULTS

Report No. 91109
Test Date: 1/10/91
Test Times:
Run A: 1002-1052
Run B: 1157-1247
Run C: 1304-1354

## SOURCE INFORMATION

Firm Name and Address
HILLS BROTHERS COFFEE CO.
1501 Mariposa Street
San Francisco, CA 94124

Firm Representative and Title
Mr. Tod E. Diebold,
Project Engineer
Phone No. (415)863-7477

Source:
S-9 Abated by A-11
Green Coffee Handling System
Plant No. 1375
Operates 8 hr/day & 260 days/yr

Permit Conditions
None

## BAAQMD REPRESENTATIVES

Source Test Engineers
C. McClure/H. Doi

Permit Services Division / Enforcement Division
J. Slamovich

Test Requested by:
J. Bean

Operating Parameters:
Green coffee handling system operated continually during testing. Chase & Sandborn blend produced at a rate of 6.1 ton per hour. 218 bags of mild, natural and robusta beans dumped during sampling.

Applicable Regulations: 6-310, 6-311

VN Recommended: NO

Source Test Results and Comments:

| METHOD: | TEST | RUN A | RUN B | RUN C | AVERAGE | LIMIT |
|---|---|---|---|---|---|---|
| ST-17 | Stack Volume Flowrate, SDCFM | | | | 6,000 | |
| | Stack Gas Temperature, °F | 68 | 71 | 72 | 70 | |
| ST-23 | Water Content, Volume % | 1.2 | 1.0 | 1.1 | 1.1 | |
| ST-15 | Particulate, gr/SDCF | .006 | .007 | .008 | .007 | .15 |
| | Particulate, lb/hr | .3 | .4 | .4 | .4 | 13.8 |
| | Isokinetic Ratio, Act/Theo. | 1.00 | .99 | .99 | | |



| Source Test Team Leader | Date | Senior Source Test Engineer | Date | Approved by Source Test Manager | Date |
|---|---|---|---|---|---|
| C. McClure | 1/16/91 | K. Kunaniec | 1/16/91 | G. Karels | 1/22/91 |

Form: Summary of Source Test Results

PSSTR: of 15 July 88

# SOURCE TEST LAB DATA SHEET

PLANT: Hills Brothers Coffee
SOURCE OPERATION: BAG House
SOURCE TEST NO.: _____
FILTER MEDIA: FLAT 110mm FIBERGLASS

PAGE 1 OF 1
INITIAL CM
TEST DATE 1/10/91

*Drying Procedure: 105 °C 24 hours before and after test, desiccated*

## FILTER DATA

| RUN NO. | FILTER NO. | TARE WEIGHT (g) | | FINAL WEIGHT (g) 1-14-91 AM | 1-15-91 PM | SAMPLE WEIGHT (g) |
|---|---|---|---|---|---|---|
| A | 461 | .7177 | .7178 | .7184 | .7183 | 0.0005 |
| B | 462 | .6784 | .6785 | .6788 | .6787 | 0.0002 |
| C | 463 | .6811 | .6812 | .6831 | .6831 | 0.0019 |
| | | | | | | |

## PROBE & CYCLONE RINSE DATA (Acetone)

| RUN NO. | FILTER NO. | JAR SAMPLE FINAL WEIGHT (g) | FILTER SAMPLE FINAL WEIGHT (g) | SAMPLE WEIGHT (g) |
|---|---|---|---|---|
| A | 461 | 0.0105 | 0.0005 | 0.0110 |
| B | 462 | 0.0110 | 0.0002 | 0.0112 |
| C | 463 | 0.0125 | 0.0019 | 0.0144 |
| | | | | |

## PROBE & CYCLONE RINSE DATA (Teflon)

| RUN NO. | PROBE/NOZZLE NOS. | JAR TARE WEIGHT (g) 1-14-91 AM | 1-15-91 PM | JAR FINAL WEIGHT (g) 1-14-91 AM | 1-15-91 PM | JAR SAMPLE WEIGHT (g) |
|---|---|---|---|---|---|---|
| A | 11 | 54.5163 | 54.5162 | 54.5268 | 54.5268 | 0.0105 |
| B | 23 | 54.9316 | 54.9320 | 54.9432 | 54.9430 | 0.0110 |
| C | 24 | 56.2980 | 56.2982 | 56.3108 | 56.3107 | 0.0125 |
| | | | | | | |

## IMPINGER DATA

| SOLUTION | NO. | A TARE WEIGHT | B FILLED WEIGHT | C FINAL WEIGHT | C-A SAMPLE WEIGHT | C-B CONDENSATE WEIGHT |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

ok 1/16/91 CM

Form "Source Test Lab Data Sheet"

HILLSBRO COFFEE #1375
S-9 1/10/91

$G = 15.43 \cdot \frac{W_p}{V_o}$ gr/SDCF

$G_A = \cancel{0.000}$ 0.0058 ⇒ 0.006 gr/SDCF $W_{p_A} = 0.0110g$

$W_{p_B} = 0.0172g$

$G_B = 0.0071 \Rightarrow 0.007$ gr/SDCF

$W_{p_C} = 0.0144_g$

$G_C = 0.0079 \Rightarrow 0.008$ gr/SDCF

$V_{D_A} = 28.83$ SDCF

$V_{D_B} = 24.39$ SDCF

$V_{D_C} = 27.92$ SDCF

$G_{AVG} = 0.007$ gr/SDCF

$M = \frac{G \cdot Q}{116.67}$ Lb/HR

$Q = 5951$ SDCFM

$M_A = 0.29 \Rightarrow 0.3$ Lb/HR

$M_B = 0.36 \Rightarrow 0.4$ Lb/HR

$M_C = 0.40 \Rightarrow 0.4$ Lb/HR

$M_{AVG} = 0.4$ Lb/HR.

# SOURCE TEST LAB DATA SHEET

PLANT: HILLS BROTHERS COFFEE
SOURCE OPERATION: BAGHOUSE A-11
SOURCE TEST NO.:
FILTER MEDIA: $H_2O$ - IMPINGERS

PAGE 1 OF 1
INITIAL HD
TEST DATE 1/10/91

*Drying Procedure: 105 °C 24 hours before and after test, desiccated*

## FILTER DATA

| RUN NO. | FILTER NO. | TARE WEIGHT (g) | | FINAL WEIGHT (g) | | SAMPLE WEIGHT ( g) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## PROBE & NOZZLE RINSE DATA (total all runs)

| RUN NO. | FILTER NO. | JAR SAMPLE FINAL WEIGHT (g) | FILTER SAMPLE FINAL WEIGHT (g) | SAMPLE WEIGHT ( g) |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## PROBE & NOZZLE RINSE DATA (each run)

| RUN NO. | PROBE/NOZZLE NOS. | JAR TARE WEIGHT (g) | | JAR FINAL WEIGHT (g) | | JAR SAMPLE WEIGHT (g) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## RINSER DATA

| SOLUTION | NO. | A TARE WEIGHT | B FILLED WEIGHT | C FINAL WEIGHT | C-A SAMPLE WEIGHT | C-B CONDENSATE WEIGHT | |
|---|---|---|---|---|---|---|---|
| $H_2O$ | P-1 | 496.8 | 596.8 | 598.6 | 100.0 | 1.8 | → 1.5 |
| | P-2 | 483.8 | 584.5 | 584.2 | 100.7 | -(0.3) | ↗ |
| | P-3 | 491.6 | 591.5 | 592.6 | 99.9 | 1.1 | → 1.0 |
| | P-4 | 493.1 | 592.8 | 592.7 | 99.7 | -(0.1) | ↗ |
| | P-5 | 495.3 | 595.4 | 596.0 | 100.1 | 0.6 | → 1.1 |
| | P-6 | 487.1 | 587.7 | 588.2 | 100.6 | 0.5 | ↗ |

Form "Source Test Lab Data Sheet"

PLASDATA ( EJ ) June 11, 19

HILL BRO. COFFEE #1375
S-4 1/10/91

ISOKINETICS

$$R_I = \frac{(V_m)(T_s)(100)}{(60)(100-\%H_2O)(A_n)(V_s)(TIME)(T_m)}$$

$D_n = 5.1mm = .51cm$

$A_n = 0.0002691\,\pi\,(D_{n_{cm}})^2 ft^2$

$A_n = 0.0002691\,\pi\,(.51)^2 ft^2$

$A_n = 2.199 \times 10^{-4} ft^2$

RUN A) $V_m = 27.68 ft^3$ $T_s = 528°R$ $V_s = 43.50 FPS$ $TIME = 50 MIN$ $T_m = 512.6°R$
$\%H_2O = 1.2$ $100-\%H_2O = 98.8$

$$R_{I_A} = \frac{(27.68)(528)(100)}{(60)(98.8)(2.199\times10^{-4})(43.50)(60)(512.6)} = 1.006$$

$\boxed{R_{I_A} = 1.00}$

RUN B) $V_m = 23.77 ft^3$ $T_s = 530.8°R$ $V_s = 37.48 FPS$ $TIME = 50 MIN$ $T_m = 520.3°R$
$\%H_2O = 1.0$ $100-\%H_2O = 99.0$

$$R_{I_B} = \frac{(23.77)(530.8)(100)}{(60)(99.0)(2.199\times10^{-4})(37.48)(50)(520.3)} = 0.991$$

$\boxed{R_{I_B} = 0.99}$

RUN C) $V_m = 27.23 ft^3$ $T_s = 532.2°R$ $V_s = 43.05 FPS$ $TIME = 50 MIN$ $T_m = 520.7°R$
$\%H_2O = 1.1$ $100-\%H_2O = 98.9$

$$R_{I_C} = \frac{(27.23)(532.2)(100)}{(60)(98.9)(2.199\times10^{-4})(43.05)(50)(520.7)} = 0.991$$

$\boxed{R_{I_C} = 0.99}$

HILLSBRO. COFFEE
PLT#1375 — S-9 GREEN COFFEE HANDLING SYSTEM
OPERATION DATA 1/10/91 0830→1400
30MIN LUNCH

MILDS

| | | |
|---|---|---|
| CLASS 1 | RWANDA | 70 BAGS @ 132LBS/BAG → 9240Lb |
| CLASS 3 | GUATAMALA | 48 BAGS @ 150LBS/BAG → 7200Lb |
| CLASS 4 | PERU | 82 BAGS @ 152/BAGS → 12464Lb |

NATURALS

| | | |
|---|---|---|
| CLASS 6 | EQUADOR | 20 BAGS @ 152LBS/BAG → 3040 |
| CLASS 6 | KENYA | 23 BAGS @ 132LBS/BAG → 3036 |

ROBUSTA

| | | |
|---|---|---|
| CLASS 9 | THAILAND | 153 BAGS @ 132LBS/BAG → 20196 |
| CLASS 10 | EQUADOR | + 40 BAGS @ 152LBS/BAG → 6080 |

436 TOTAL PROCESSED 61,256Lb.

$\frac{436 \text{ BAGS}}{5 \text{ HRS}} = 87 \text{ BAGS/HOUR} \times \frac{50 \text{ MIN}}{60 \text{ MIN}} \times 3 \text{ RUNS} =$ CHASE & SANBORN BLEND.

218 BAGS DUMPED DURING 3 SAMPLING RUNS

0830→1400
30MIN LUNCH
0830→1400
↓
5 HOURS

RATE: $61256 \text{ lb}/5 \text{ HRS} = 12251.2 \text{ lb/HR} \left(\frac{1 \text{ TON}}{2000 \text{ lb}}\right) = 6.12 \text{ TON/HR}$

MAXIMUM EMISSIONS 6-311

$E_{MAX} = (P_{TON/HR})^{(.67)} \times 4.10 = (6.12)^{.67}(4.10) =$ **13.8 Lb/HR MAXIMUM EMISSIONS**

Filename: COFFEE17.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

| Test ID | Parameter | Units | Values reported | | | |
|---|---|---|---|---|---|---|
| | | | Run 1 | Run 2 | Run 3 | Run 4 |
| 1 | Stack temperature | Deg F | 68 | 71 | 72 | |
| GREEN COFFEE HANDLING SYSTEM | Moisture | % | 1.2 | 1 | 1.1 | |
| | Oxygen | % | ND | ND | ND | |
| | Volumetric flow, actual | acfm | ND | ND | ND | |
| | Volumetric flow, standard* | dscfm | 6000 | 6000 | 6000 | (AVERAGE) |
| | Isokinetic variation | % | 99 | 98 | 94 | |
| Circle: Production or feed rate Capacity: | | TPH | 6.12 | 6.12 | 6.12 | |
| | Pollutant concentrations: | | | | | |
| | Filterable PM | G/dscf | 0.006 | 0.007 | 0.008 | |
| | Pollutant mass flux rates: | | | | | |
| | Filterable PM | lb/hr | 0.309 | 0.360 | 0.411 | |
| | Emission factors (ENGLISH UNITS): | | | | | AVERAGE |
| | Filterable PM | lb/ton | 0.0504 | 0.0588 | 0.0672 | 0.0588 |
| | Emission factors (METRIC UNITS): | | | | | AVERAGE |
| | Filterable PM | kg/Mg | 0.0252 | 0.0294 | 0.0336 | 0.0294 |

Filterable PM = Total PM for this source. DATA RATING: C.