Engineering Evaluation Report
Counter Culture Coffee
Application No. 28103
Plant No. 23021

BACKGROUND

Counter Culture Coffee is applying for an Authority to Construct and/or Permit to Operate the following equipment:

S-2 Coffee Roaster, San Franciscan Roaster SF-25, 0.1 MMBtu/hr; abated by A-3 Afterburner with Cyclone, San Franciscan SF-25 Afterburner, 0.25 MMBtu/hr

Counter Culture Coffee is proposing to use S-2 Coffee Roaster to roast small batches of coffee beans. It roasts and cools the beans and has a cyclone and afterburner.

EMISSION CALCULATIONS

Emissions for criteria pollutants nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO_2), precursor organic compounds (POC), and particulate matter (PM_{10}) are shown below.

Basis:
S-2

- 100 lbs/hr (25 lb capacity, 15 min/cycle, continuous operation)
- Coffee Throughput = 104 tons/yr
- Operation hours = 8 hr/day, 5 days/week, 52 weeks/year = 2,080 hours/year
- Roaster Firing Rate = 0.1 MM BTU/hr
- Afterburner Firing Rate = 0.25 MMBTU/hr
- Daily fuel throughput = 0.35 MMBTU/hr (8 hrs/day) = 2.8 MMBTU/day
- Annual fuel throughput = 0.35 MMBTU/hr (2080 hrs/yr) = 728 MMBTU/yr
- Heat capacity = 1,050 MMBtu/106 ft3 natural gas
- A-3 POC Destruction Efficiency 90% by weight

Combustion Emission Calculations:

Emission factors taken from AP-42, Table 1.4-2 (revised 7/1/98) for small boiler <100 MMBtu/hr, uncontrolled, are taken for NOx, CO, SO2, and VOC for the combustion of natural gas:

NOx = (100 lb/ MMscf)/ (1050 MMBtu/MMscf) = 0.095 lb/MMBtu
CO = (84 lb/ MMscf)/ (1050 MMBtu/MMscf) = 0.08 lb/MMBtu
POC = (5.5 lb/MMscf)/ (1050 MMBTU/MMscf) = 0.00524 lb/MMBtu
SO_2 = (0.6 lb/MMscf)/ (1050 MMBtu/MMscf) = 5.7 x 10-4 lb/MMBtu

	Emission Factor	Emission Factor	Emissions	Emissions	Emissions	Emissions
Pollutant	**(lb/MMscf)**	**(lb/MMBtu)**	**(lb/hour)**	**(lb/day)**	**(lb/year)**	**(ton/year)**
NOx	100	0.09524	3.33E-02	0.27	69.3	0.035
CO	84	0.08000	2.80E-02	0.22	58.2	0.029
POC	5.5	0.00524	1.83E-03	0.01	3.8	0.002
SO_2	0.6	0.00057	2.00E-04	0.002	0.4	0.000

Roaster Emission Calculations:

Table 9.13.2-1 and 9.13.2-2 from AP-42 Chapter 9.13.2 (Coffee Roasting) provides the following emission factors for particulate (as PM10), volatile organics (VOC), and carbon monoxide from the coffee roasting process:

Emission Factors for Coffee Roasting Operations

Green coffee bean screening, handling, and storage	PM10 = 0.059 lb/ton
Batch roaster with thermal oxidizer	PM10 = 0.12 lb/ton VOC = 0.047 lb/ton CO = 0.55 lb/ton

Pollutant	Emission Factor (lb/ton)	Emissions (lb/hour)	Emissions (lb/day)	Emissions (lb/year)	Emissions (ton/year)
CO[1]	0.55	2.75E-02	0.22	57.2	0.029
POC[1]	0.047	2.35E-03	0.02	4.9	0.002
PM10[2]	0.179	8.95E-03	0.07	18.6	0.009

1. AP-42 Table 9.13.2-2 Coffee Roasting, Batch roaster with thermal oxidizer
2. AP-42 Table 9.13.2-1 Coffee Roasting, Batch roaster with thermal oxidizer plus Green coffee bean screening, handling, and storage

Emissions Summary:

Combustion emissions + roaster emissions = Total emissions

Pollutant	Emissions (lb/day)	Emissions (lb/year)	Emissions (ton/year)
NOx	0.27	69.33	0.035
CO	0.44	115.44	0.058
POC	0.03	8.70	0.004
PM_{10}	0.07	18.62	0.009
SO_2	0.002	0.42	0.000

For Compliance with Regulation 6 -1-310 Particulate Weight Limitations:
Limitation of 0.15 grain/dscf

Basis: 1 hour of roaster operation
100 lbs/hr roaster capacity
Roaster emission point: 850 acfm @ 1200^0F
850 acfm(460+70°R)/(460+1200 °R) =
271 scfm @ 70^0F

Grain loading calculation from coffee roasting process:
[18.62 lb PM_{10}/yr X 7000 grain/lb] / [60 min/hr X 2,080 hr/yr X 271 dscfm]
= 0.004 grain/dscf

For Compliance with Regulation 6-1-311 General Operations:
Emission limit for S-2
Emission limit =4.10*P^0.67 = 0.55 lb/hr
where P=process rate (tons/hr)
= 100 lb/hr/(2000 lb/ton)
= 0.05 ton PM/hr

Hourly emissions from S-1
= 8.95E-03 lb PM/hr

CUMULATIVE INCREASE

Pollutant	Cumulative Increase Post-1991, ton/year	Increase Cumulative Increase (ton/year)	Total Cumulative Increase (ton/year)
NOx	0.181	0.035	0.216
CO	0.160	0.058	0.218
POC	0.003	0.004	0.007
PM_{10}	0.106	0.009	0.115
SO_2	0.010	0.000	0.010

STATEMENT OF COMPLIANCE

Regulation 1 - General Provisions and Definitions
§1-301: This section prohibits discharging emissions in quantities that cause injury, detriment, nuisance or annoyance. The facility is expected to comply with this requirement.

Permits - General Requirements, Regulation 2, Rule 1
The facility is located within 1000 feet of the outer boundary of the nearest K-12 school (LePort Montessori, 1450 63rd St, Emeryville, CA 94608). Therefore, the public notification requirements of Regulation 2-1-412 are triggered.

Permits - New Source Review, Regulation 2, Rule 2
Best Available Control Technology Requirements, §2-2-301: A Best Available Control Technology (BACT) review is required for any new or modified source which may have POC, NPOC, NOx, SO_2, PM_{10}, or CO emissions greater than 10 pounds per highest day. S-2 does not trigger BACT requirements since emissions are estimated at less than 10 lb/day for these pollutants.

Health Risk Screening Analysis, Regulation 2, Rule 5
According to Chapter 9.13.2, Coffee Roasting of AP-42, the roaster (S-2) is the main source of gaseous pollutants, including aldehydes and acrolein. However, the California Air Resources Board has invalidated the source test method for acrolein. Until CARB approves a new test method and acrolein emissions are estimated from factors developed using the new test method, the District is not evaluating risk for acrolein.

There are no California Air Toxics Emission Factors (CATEF) factors for the aldehydes from coffee roasting. However, source testing from Peets Coffee and Tea determined the following toxic emission factors:
Formaldehyde = 0.0008 lb/ton
Acetaldehyde = 0.0005 lb/ton

Summary of Toxic Pollutants

Pollutant	Emission Factors (lb/ton)	Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)	Trigger Level (lb/hr)	Trigger Level (lb/yr)
Formaldehyde	0.0008	4.00E-05	0.1	0.12	18
Acetaldehyde	0.0005	2.50E-05	0.1	1.0	38

Note: * The California Air Resources Board has invalidated the source test method for acrolein. Until CARB approves a new test method and acrolein emissions are estimated from factors developed using the new test method, the District is not evaluating risk for acrolein, per the Risk Screening Memo.

As shown above, emissions of formaldehyde and acetaldehyde are below the trigger levels contained in District Regulation 2, Rule 5 and no risk screen is required for this application.

Particulate Matter and Visible Emissions, Regulation 6, Rule 1
Section 301 prohibits for more than 3 minutes per hour, visible emissions as dark or darker than Ringelmann 1 or equivalent opacity. This facility is expected to comply with this standard.
Section 305 prohibits emissions of visible particles from causing a nuisance on property other than the operator's. This operation is expected to comply with this standard. Section 310 limits emissions to less than 0.15 gr/dscf. The facility is expected to comply with this standard. Section 311 limits emissions based on process weight. The facility is expected to comply with the process weight limitations contained in this section at all emission points.

Odorous Substances, Regulation 7
If the standards in this rule become applicable, then the facility is expected to comply with these standards.

New Source Performance Standard (NSPS)/ National Emission Standard for Hazardous Air Pollutants (NESHAP)
There is no New Source Performance Standard or National Emission Standard for Hazardous Air Pollutants that applies to this source.

California Environmental Quality Act (CEQA)
This project is considered to be ministerial under the District's CEQA Regulation 2-1-311. The engineering review for this project requires only the application of standard permit conditions and standard emission factors as defined in the Permit Handbook, Section 11, Chapter 3 and therefore is not discretionary as defined by CEQA. A ministerial project is not considered discretionary, as defined by CEQA and therefore is not subject to CEQA review.

OFFSETS

Offset Requirements, §2-2-302: Total facility emissions of NOx and POC are less than and will not be permitted to exceed 10 tons per year of NOx or POC and emission reduction credits are not required for this application.

Offset Requirements, §2-2-303: Total facility emissions will be less than 100 tons per year of PM10 and SO2. Therefore, this facility is not required to provide emission offsets for PM10 and SO2.

Prevention of Significant Deterioration (PSD)
The PSD permit program does not apply to this facility.

CONDITIONS
The facility-wide natural gas usage limit is contained in the condition 26015 for S-1 Coffee Roaster and will be updated.

Condition 26327

1. The owner/operator shall not exceed the following limits at the sources indicated over any consecutive 12-month period:
S-2 104 tons green beans/yr
[basis: Cumulative Increase]

2. The owner/operator shall ensure that S-2 is abated at all times of operation by properly maintained and properly operated A-3 Afterburner with cyclone. [basis: Cumulative Increase]

3. The owner/operator shall maintain a minimum burner/oxidizer temperature of A-3 to be 1200° F and maintain a residence time of at least 0.3 seconds. [basis: Regulation 2-1-403]

4. The temperature limit in part 3 shall not apply during an “Allowable Temperature Excursion”, provided that the temperature controller setpoint complies with the temperature limit. An Allowable Temperature Excursion is one of the following:
   a. A temperature excursion not exceeding 20 deg. F; or
   b. A temperature excursion for a period or periods which when combined are less than or equal to 15 minutes in

any hour; or

c. A temperature excursion for a period or periods which when combined are more than 15 minutes in any hour provided that all three of the following criteria are met
   i. the excursion does not exceed 50 deg. F;
   ii. the duration of the excursion does not exceed 24 hours; and
   iii. the total number of such excursions does not exceed 12 per calendar year (or any consecutive 12 month period).

Two or more excursions greater than 15 minutes in duration occurring during the same 24-hour period shall be counted as one excursion toward the 12-excursion limit. (Basis: Regulation 2-1-403)

5. For each Allowable Temperature Excursion that exceeds 20 deg. F and 15 minutes in duration, the Permit Holder shall keep sufficient records to demonstrate that it meets the qualifying criteria described in part 7. Records shall be retained for a minimum of two years from the date of entry, and shall be made available to the District upon request. Records shall include at least the following information:

a. Temperature controller setpoint;
b. Starting date and time, and duration of each Temperature Excursion;
c. Measured temperature during each Temperature Excursion;
d. Number of Temperature Excursions per month, and total number for the current calendar year; and
e. All strip charts or other temperature records.
(Basis: Regulation 2-1-403)

6. The owner/operator shall ensure that A- 3 Afterburner is equipped with a temperature-measuring device capable of continuously measuring and recording the temperature in the thermal oxidizers. These devices shall be accurate to within 10 degrees Fahrenheit (° F) and shall be maintained in accordance with manufacturer's recommendations. These temperature monitors shall be used to determine compliance with the temperature requirements in Part 3. [basis: Regulation 1-521]

7. To demonstrate compliance with the above conditions, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above conditions, including the following information:
a. Monthly records of the quantity of green coffee beans roasted at S-2 Coffee Roaster.
c. Monthly records shall be totaled for each consecutive 12-month period.
d. Records of continuous temperature measurements of A- 3 Afterburner whenever S-2 Coffee Roaster is in operation.
All records shall be retained onsite for two years from the date of entry, and made available for inspection by District staff upon request. These record keeping requirements shall not replace the record keeping requirements contained in any applicable District Regulations. [Basis: Recordkeeping]

Condition 26015

1. The owner/operator shall not exceed the following limits at the sources indicated over any consecutive 12-month period:
S-1 967.2 tons green beans/yr
Natural Gas Usage (facility-wide) ~~1872~~ 2600 therms/year
[basis: Cumulative Increase]

2. The owner/operator shall ensure that S-1 is abated at all times of operation by properly maintained and properly operated A-1 integral Cyclone and A-2 integral afterburner. [basis: Cumulative Increase]

3. The owner/operator shall maintain a minimum burner/oxidizer temperature of A-2 to be 1300° F and maintain a residence time of at least 0.3 seconds. [basis: Regulation 2-1-403]

4. The temperature limit in part 3 shall not apply during an "Allowable Temperature Excursion", provided that the temperature controller setpoint complies with the temperature limit. An Allowable Temperature Excursion

is one of the following:
a. A temperature excursion not exceeding 20 deg. F; or
b. A temperature excursion for a period or periods which when combined are less than or equal to 15 minutes in any hour; or
c. A temperature excursion for a period or periods which when combined are more than 15 minutes in any hour provided that all three of the following criteria are met
   i. the excursion does not exceed 50 deg. F;
   ii. the duration of the excursion does not exceed 24 hours; and
   iii. the total number of such excursions does not exceed 12 per calendar year (or any consecutive 12 month period).

Two or more excursions greater than 15 minutes in duration occurring during the same 24-hour period shall be counted as one excursion toward the 12-excursion limit. (Basis: Regulation 2-1-403)

5. For each Allowable Temperature Excursion that exceeds 20 deg. F and 15 minutes in duration, the Permit Holder shall keep sufficient records to demonstrate that it meets the qualifying criteria described in part 7. Records shall be retained for a minimum of two years from the date of entry, and shall be made available to the District upon request. Records shall include at least the following information:
a. Temperature controller setpoint;
b. Starting date and time, and duration of each Temperature Excursion;
c. Measured temperature during each Temperature Excursion;
d. Number of Temperature Excursions per month, and total number for the current calendar year; and
e. All strip charts or other temperature records.
(Basis: Regulation 2-1-403)

6. The owner/operator shall ensure that A- 2 integral afterburner is equipped with a temperature-measuring device capable of continuously measuring and recording the temperature in the thermal oxidizers. These devices shall be accurate to within 10 degrees Fahrenheit (° F) and shall be maintained in accordance with manufacturer's recommendations. These temperature monitors shall be used to determine compliance with the temperature requirements in Part 3. [basis: Regulation 1-521]

7. To demonstrate compliance with the above conditions, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above conditions, including the following information:
a. Monthly records of the quantity of green coffee beans roasted at S-1 Coffee Roaster.
b. Monthly records of natural gas usage.
c. Monthly records shall be totaled for each consecutive 12-month period.
d. Records of continuous temperature measurements of A-2 integral afterburner whenever S-1 Coffee Roaster is in operation.
All records shall be retained onsite for two years from the date of entry, and made available for inspection by District staff upon request. These record keeping requirements shall not replace the record keeping requirements contained in any applicable District Regulations. [Basis: Recordkeeping]

VI. RECOMMENDATION

Issue Authority to Construct to Counter Culture Coffee for the following equipment:

S-2 Coffee Roaster, San Franciscan Roaster SF-25, 0.1 MMBtu/hr; abated by A-3 Afterburner with Cyclone, San Franciscan SF-25 Afterburner, 0.25 MMBtu/hr

By _____ Date _____
Flora Chan, Air Quality Engineer