

DRAFT
Engineering Evaluation Report
Sightglass Coffee Roasters, LLC
270 7th Street
San Francisco, CA 94103
Plant # 20020
Application # 21391

I. BACKGROUND

Sightglass Coffee Roasters wants to operate a coffee roastery. They have purchased a circa 1962 refurbished direct fired batch roaster and are applying for an Authority to Construct the following equipment:

S-1 Coffee Roaster, Probat UG22n 150 pounds per hour abated by A-1 Probat Cyclone and A-2 Thermal Oxidizer, Conversion Products TR18/34V-500MC-60NB

Since the coffee roaster over 40 years old, the burners have been replaced by Probat with 3 tubes allowing three firing rates of 40K, 80K, and 120K BTU per hour. The unit has a separate cyclone which serves two functions: 1) to separate chaff and the other particulate matter from the hot air exhausted from the roaster and, 2) to provide an air entrance into the thermal oxidizer. The hot air discharge from the roaster is processed in the thermal oxidizer at a minimum of 1250 degrees F and with a residence time in excess of 0.5 seconds.

At the end of the roasting cycle, the beans are transferred to the cooling pan. The particulate emissions from this cooling cycle are abated by the thermal oxidizer.

The applicant indicates a projected green bean throughput of 150 tons per year.

II. EMISSION CALCULATIONS

Emission increases from combustion of natural gas at the batch roaster and thermal oxidizer:

Basis:

- Coffee Throughput = 300,000 lb/yr = 150 tons/yr
- Operation hours = 300,000 lbs/yr/150 lb/hr = 2000 hours/yr
- Roaster Firing Rate = 0.12 MM BTU/hr
- Afterburner Firing Rate = 3.5 MMBTU/hr
- Total fuel throughput = 0.12 +3.5 MMBTU/hr (2000 hr/yr) = 7240 MMBTU/yr of natural gas.
- Heat capacity = 1,050 MMBtu/10⁶ ft³ natural gas
- A-2 VOC Destruction Efficiency 90% by weight
- Emission factors taken from AP-42, Table 1.4-2 (revised 7/1/98) for small boiler <100 MMBtu/hr

$$\text{NOx} = (100 \text{ lb/ MMscf}) / (1050 \text{ MMBtu}/10^6 \text{ ft}^3) = 0.095 \text{ lb/MMBtu}$$

$$\text{CO} = (84 \text{ lb/ MMscf}) / (1050 \text{ MMBtu}/10^6 \text{ ft}^3) = 0.08 \text{ lb/MMBtu}$$

$$\text{SO}_2 = (0.6 \text{ lb/MMscf}) / (1050 \text{ MMBtu}/10^6 \text{ ft}^3) = 5.7 \times 10^{-4} \text{ lb/MMBtu}$$

$$PM_{10} = (7.6 \text{ lb/MMscf}) / (1050 \text{ MMBtu}/10^6 \text{ ft}^3) = 0.00724 \text{ lb/MMBtu}$$

$$POC = (5.5 \text{ lb/MMscf}) / (1050 \text{ MMBtu}/10^6 \text{ ft}^3) = 0.00524 \text{ lb/MMBtu}$$

$$NPOC = (2.3 \text{ lb/MMscf}) / (1050 \text{ MMBTU}/10^6 \text{ ft}^3) = 0.00219 \text{ lb/MMBtu}$$

Combustion Emission Calculations:

$$NO_x = 7240 \text{ MMBtu/yr} \times 0.095 \text{ lb/MMBtu} = 687.80 \text{ lb/yr}$$

$$CO = 7240 \text{ MMBtu/yr} \times 0.08 \text{ lb/MMBtu} = 579.20 \text{ lb/yr}$$

$$SO_2 = 7240 \text{ MMBtu/yr} \times 0.00057 \text{ lb/MMBtu} = 4.13 \text{ lb/yr}$$

$$PM_{10} = 7240 \text{ MMBtu/yr} \times 0.00724 \text{ lb/MMBtu} = 52.42 \text{ lb/yr}$$

$$POC = 7240 \text{ MMBtu/yr} \times 0.00524 \text{ lb/MMBtu} = 37.94 \text{ lb/yr}$$

$$NPOC = 7240 \text{ MMBtu/yr} \times 0.00219 \text{ lb/MMBtu} = 15.86 \text{ lb/yr}$$

All emissions are less than 3 lb per day.

Emission increases from batch roaster:

Emission factors (batch roaster abated by thermal oxidizer) for emissions of particulate and organics are taken from Permit Handbook Section 11.3, "Coffee Roasters" and AP-42 Table 9.13.2-1.

Pollutant	Emission Factors (lb/ton)	Throughput (ton.yr)	Maximum Daily Emissions (lb/day)	Annual Average Daily Emissions (lb/day)	Annual Emissions (lb/yr)	Maximum Annual Emissions (TPY)
PM10 (abated)	0.148**	150	0.09	0.06	22.2	0.011
POC (abated)	0.047	150	0.03	0.02	7.1	0.004

** (0.12 + 0.028 = 0.148)

Compliance with Regulation 6
Regulation 6-310 Particulate Weight Limitation:

Basis: 1 hour of roaster operation
150 lbs/hr roaster capacity
roaster emission point: 4913 acfm @ 1400 degrees F
1400 scfm @ 70 degrees F
Limitation of 0.15 grain/dscf

Grain Loading calculation from coffee roasting process:
[24.0 lb PM₁₀/yr X 7000 grain/lb] / [60 min/hr X 2000 hr/yr X 1400 dscfm] =
0.001 grain/dscf.

III. PLANT CUMULATIVE INCREASE

Pollutant	Current TPY	Annual Emissions (lbs/yr)	Maximum Annual Emissions (TPY)
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NO _x	0	687.80	0.34
PM10	0	74.62	0.04
Organic (VOC)	0	45.04	0.02
CO	0	579.2	0.29
NPOC	0	15.86	Neg.
SO2	0	4.13	Neg.

IV. TOXIC RISK SCREENING ANALYSIS

According to Chapter 9.13.2, Coffee Roasting of AP-42, the roaster 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 was performed at Peets Coffee and Tea, Inc. and determined the following toxic emission factors:

Summary of Toxic Pollutants

Pollutant	Emission Factors (lb/ton)	Throughput (ton.yr)	Annual Emissions (lb/yr)	Hourly Emissions (lb/hr)	Trigger Level (lb/hr)	Trigger Level (lb/yr)
Formaldehyde	0.0008	150	0.12	Neg.	0.21	30
Acetaldehyde	0.0005	150	0.075	--	--	64

A toxic risk screen is not triggered.

V. BACT ANALYSIS

BACT is not required for S-1 (Coffee Roaster), because criteria pollutant emissions do not exceed 10 pounds per worst-case day.

VI. OFFSET ANALYSIS

Offsets are not required since facility POC and NO_x emissions do not exceed 10 ton/yr.

VII. CEQA REVIEW

This application is considered to be ministerial under the District's proposed CEQA guidelines (Regulation 2-1-311) and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emission factors in accordance with Permit Handbook Chapter 11.3.

VIII. STATEMENT OF COMPLIANCE

Source S-1 will comply with Regulation 6 as the estimated particulate emission of 0.001 gr/dscf will comply with the 0.15 gr/dscf standard allowed per Regulation 6-310.

NSPS, PSD, and NESHAPS are not triggered.

This project is within 1000 feet of the following school:

*Bessie Carmichael/Filipino Education School
375 Seventh St.
San Francisco, CA 94103
San Francisco County
Phone: (415) 355-6916
Fax: (415) 355-7683
Grades K-8
Public school 580 students*

Sightglass Coffee Roasters, LLC is subject to the public notification requirement of Regulation 2-1-412. A public notice will be prepared and sent out to all parents and guardians of students at Bessie Carmichael/FEC School and to all residents and businesses located within 1,000 feet of the Sightglass Coffee Roasters.

IX. CONDITIONS

- 1. The owner/operator shall not roast more than 150 tons of green coffee beans in S-1 totaled over any consecutive 12-month period. [Basis: Cumulative Increase]**
- 2. The owner/operator shall abate S-1 Coffee Roaster at all times by A-1 Thermal Oxidizer. [Basis: Cumulative Increase]**
- 3. The owner/operator shall maintain a minimum furnace temperature of A-1 to be at least 1250° F. [Basis: Regulation 2-1-403]**
- 4. The owner/operator shall ensure that A-1 Thermal Oxidizer be equipped with a temperature-measuring device capable of continuously measuring and recording the temperature in A-1 Thermal Oxidizer. This device shall be accurate to within 10 degrees Fahrenheit (° F) and shall be maintained in accordance with manufacturer's recommendations. This temperature monitor shall be used to determine compliance with the temperature requirements in Condition 3. [Basis: Regulation 1-521]**
- 5. The permit to operate for S-1 Coffee Roaster is contingent upon compliance with Regulation 1-301, Standard for Public Nuisance, and Regulation 7, Odorous Substances. Upon receipt of a violation for either of these statutes, the Air Pollution Control Officer may require the operator to curtail operations until either the operation can be modified or the meteorological conditions change, such that the community is no**

longer adversely impacted. [Basis: Regulation 1-301, 7-301, 7-302, 7-303]

6. 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.
 - b. Monthly usage records shall be totaled for each consecutive 12-month period.
 - c. Records of continuous temperature measurements of A-1 Thermal Oxidizer 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: Cumulative Increase]

X. RECOMMENDATION

It is recommended that Authority to Construct be granted to Sightglass Coffee Roasters, LLC for:

S-1 Coffee Roaster, Probat UG22n 150 pounds per hour abated by A-1 Probat Cyclone and A-2 Thermal Oxidizer, Conversion Products TR18/34V-500MC-60NB

By: _____
Nancy Yee
Air Quality Engineer

2/25/10 Date