

ENGINEERING EVALUATION
Mavelous Coffee Roaster
PLANT NO. 23396 APPLICATION NO: 27686

BACKGROUND

Mavelous Coffee Roaster of San Francisco, CA is applying for an Authority to Construct and/or Permit to Operate for the following equipment:

S-1 Probat P12 Coffee Roaster, 106 lb/hr capacity, 140,000 btu/hr. Abated by A-1

A-1 Probat Burns TO-2 Afterburner, 1,500,000 btu/hr

The coffee roaster S-1 will be located at 1408 Market Street, San Francisco and will be abated by afterburner A-1 to eliminate smoke and odor generated. The principal emissions from coffee roasting processes are particulate matter (PM), precursor organic compounds (POC), and combustion products. Emissions of carbon monoxide (CO) and nitrogen oxides (NO_x) are expected as a result of combustion of natural gas.

Basis:

- Maximum Roaster Throughput: 106 lb/hr
- Hours of operation: 5,824 hr/yr
- Annual Throughput: 617,344 lb/yr (309 tons/yr)
- Roaster Maximum Firing Rate: 0.14 MMbtu/hr
- Afterburner Maximum Firing Rate: 1.5 MMbtu/hr
- Total Fuel Throughput: 1.64 MMbtu/hr
- Yearly Fuel Throughput: 9,551 MMbtu/yr
- Heat Capacity of Natural Gas: 1,050 MMbtu/MMscf

EMISSIONS CALCULATIONS**Emissions from Fuel Combustion**

Emissions due to fuel combustion are calculated based on hours of operation, maximum firing rate of afterburner and roaster, and emission factors from Compilation of Air Pollutant Emission Factors (AP-42), Chapter 1.4 “Natural Gas Combustion”.

Table 1. Emissions from Natural Gas Combustion

Hours of Operation (hr/yr)	Total Fuel Throughput (Mmbtu/hr)	Fuel Heat Capacity (Mmbtu/hr)	Pollutant	Emission Factor (lb/MMscf)	Maximum Daily Emission (lb/day)	Annual Emission (lb/yr)	Annual Emission (TPY)
5824	1.64	1050	NO _x	100 ^a	2.50	909.65	0.455
			CO	84 ^a	2.10	764.11	0.382
			POC	5.5 ^b	0.14	50.03	0.025
			PM	7.6 ^b	0.19	69.13	0.035
			SO ₂	0.6 ^b	0.01	5.46	0.003
			CH ₄	2.3 ^b	0.06	20.92	0.011

^a From EPA AP-42 Table 1.4-1

^b From EPA AP-42 Table 1.4-2

Emissions from Batch Roasting

Emissions from batch roasting of coffee are calculated based on the maximum roaster throughput, hours of operation, and AP-42 emission factors from AP-42, Chapter 9.13.2 “Coffee Roasting”.

Table 2. Emissions from Batch Roasting

Hours of Operation (hr/yr)	Maximum Roaster Throughput (lb/hr)	Pollutant	Emission Factor (lb/ton)	Annual Emission (lb/yr)	Annual Emission (TPY)
5824	106	CO	0.55 ^a	169.77	0.085
		POC	0.047 ^a	14.51	0.007
		PM	0.148 ^a	45.68	0.023

^a From EPA AP-42 Table 9.13.2-1 and Table 9.13.2-2

Total Emissions

Total emissions from S-1 were calculated by adding the emissions from batch roasting and natural gas combustion.

Table 3. Total Emissions from S-1

Pollutant	Emissions from Fuel Combustion (lb/yr)	Emissions from Batch Roasting (lb/yr)	Total Daily Emissions (lb/yr)	Total Emissions (lb/yr)	Total Emissions (TPY)
NO _x	909.65	0.00	2.50	909.65	0.455
CO	764.11	169.77	2.57	933.88	0.467
POC	50.03	14.51	0.18	64.54	0.032
PM	69.13	45.68	0.32	114.82	0.057
SO ₂	5.46	0.00	0.01	5.46	0.003
CH ₄	20.92	0.00	0.06	20.92	0.011

Plant Cumulative Increase

Table 4 summarizes the cumulative increase in criteria pollutant emissions that will result from the operation of S-1.

Table 4. Plant Cumulative Emissions

Pollutant	Existing Emissions (TPY)	New Increase (TPY)	Cumulative Increase (TPY)
NO _x	0.000	0.455	0.455
CO	0.000	0.467	0.467
POC	0.000	0.032	0.032
PM	0.000	0.057	0.057
SO ₂	0.000	0.003	0.003
CH ₄	0.000	0.010	0.010

Compliance with Regulation 6-1-310 Particulate Weight Limitation

Regulation 6-1-310, Particulate Weight Limitation, states that source may not emit particulate matter in excess of 0.15 grain/dscf. This coffee roasting operation is expected to emit particulate matter at a rate two orders of magnitude below the 0.15 grain/dscf limit; thus, S-1 will comply with Particulate Weight Limitation set forth in Regulation 6-1-310.

TOXIC RISK SCREENING

According to AP-42 Chapter 9.13.2, coffee roasting operation emits toxic air contaminants (TAC) such as aldehyde and acrolein. However, the test method for acrolein was invalidated by the California Air Resources Board (CARB); thus, the District is not evaluating risk for acrolein until a new test method is developed. Since there are no California Air Toxics Emissions Factors (CATEF) for the aldehydes, emission factors derived from source test of Peets Coffee and Tea, Inc. will be used to estimate emissions of acetaldehyde and formaldehyde.

Table 5. TAC Emissions from Batch Roasting

Hours of Operation (hr/yr)	Maximum Roaster Throughput (lb/hr)	Pollutant	Emission Factor (lb/ton)	Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)
5824	106	Acetaldehyde	5.00E-04	2.65E-05	1.54E-01
		Formaldehyde	8.00E-04	4.24E-05	2.47E-01

The emission factors for the TACs used on Table 6 are from the District Policy – “Emissions Factors for Toxic Air Contaminants from Miscellaneous Natural Gas Combustion” approved on February 28th, 2008.

Table 6. TAC Emissions from Natural Gas Combustion

Hours of Operation (hr/yr)	Total Fuel Throughput (MMbtu/hr)	Fuel Heat Capacity (MMbtu/MMscf)	Pollutant	Emission Factor (lb/MMscf)	Hourly Emission (lb/hr)	Annual Emissions (lb/yr)
5824	1.64	1050	Benzene	2.10E-06	3.28E-09	1.91E-05
			Formaldehyde	7.50E-05	1.17E-07	6.82E-04
			Toluene	3.40E-06	5.31E-09	3.09E-05

Table 7. Total TAC Emissions from S-1

Pollutant	Total Hourly Emissions (lb/hr)	Acute Trigger Level (lb/hr)	Over Acute Trigger?	Total Annual Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	Over Chronic Trigger?
Acetaldehyde	2.65E-05	None	No	1.54E-01	6.40E+01	No
Benzene	3.28E-09	2.90E+00	No	1.91E-05	6.40E+00	No
Formaldehyde	4.25E-05	2.10E-01	No	2.48E-01	3.00E+01	No
Toluene	5.31E-09	8.20E+01	No	3.09E-05	1.20E+04	No

Based on calculations above, emissions of TACs for S-1 do not exceed acute or chronic trigger levels set forth in Regulation 2-5; therefore, a toxic risk screen is not required.

BEST AVAILABLE CONTROL TECHNOLOGY

In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NO_x, CO, SO₂ or PM₁₀.

Based on the emissions calculations above, BACT is not triggered for any pollutants since the emissions for the criteria pollutants do not exceed 10 pounds per day.

OFFSETS

Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/yr of POC or NO_x. Based on the emission calculations above, offsets are not required for this application.

NEW SOURCE PERFORMANCE STANDARDS (NSPS)

No subpart of 40 CFR Part 60 applies to S-1.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

No subpart of 40 CFR Part 63 applies to S-1.

PUBLIC NOTICE

The proposed coffee roaster set is located within 1,000 feet of one or more schools providing educational services to students enrolled in kindergarten or grades 1 through 12. Under the California Health and Safety Code §42301.6 and Regulation 2-1-412, notification of the proposed new source must be mailed to the parents or guardians of all children enrolled in any school within one-quarter mile of the source, and to each address within a radius of 1,000 feet of the source to give these parties an opportunity to provide public comment on the proposed actions.

STATEMENT OF COMPLIANCE

S-1 will comply with Regulation 6, Rule 1, since estimated particulate emissions for S-1 are less than the limit of 0.15 grains / dscf.

This application is considered to be ministerial under the District's 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.

PERMIT CONDITIONS

Application #27686: Mavelous Coffee Roaster: Plant #23396: Conditions for S-1

PC 26237

1. The owner/operator shall not exceed the following limits at the sources indicated over any consecutive 12-month period:

S-1	310 tons/yr
Natural Gas Usage (facility-wide)	9,600 MMscf/yr
2. The owner/operator shall abate S-1 Coffee Roaster at all times while operating by the afterburner A-1. [Basis: Cumulative Increase]
3. The owner/operator shall maintain a minimum furnace temperature of 1200° F at the afterburner and maintain a residence time of at least 0.3 seconds. [Basis: Regulation 2-1-403]
4. The owner/operator shall ensure that the afterburner is equipped with a temperature-measuring device capable of continuously measuring and recording the temperature in the afterburner. This device 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]
5. The owner/operator shall not emit from any source for period or periods aggregating more than three minutes in any hour, a visible emission which is as dark or darker than No. 0.5 on the Ringelmann Chart of of such opacity as to obscure an observer's view to an equivalent or greater degree. [Basis: Regulation 6-1]

- 6. To demonstrate compliance, 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 Roasters.
 - b. Monthly records of natural gas usage.
 - c. Monthly usage records shall be totaled for each consecutive 12-month period.
 - d. Records of continuous temperature measurements of afterburner whenever S-1 Coffee Roasters are 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]

RECOMMENDATION

The District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of District, state, and federal air quality-related regulations. The preliminary recommendation is to issue a Permit to Operate for the equipment listed below. However, the proposed source(s) will be located within 1,000 feet of a school, which triggers the public notification requirements of District Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

I recommend that the District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct and/or a Permit to Operate for the following source(s):

- S-1 Probat P12 Coffee Roaster, 106 lb/hr capacity, 140,000 btu/hr. Abated by A-1**
- A-1 Probat Burns TO-2 Afterburner, 1,500,000 btu/hr**

By: _____
 Brenda Cabral
 Air Quality Engineer

Date: _____