Engineering Evaluation
Hedge Coffee LLC
434 Shotwell Street
San Francisco, CA 94110
Application No. 32019
Plant No. 25287
OBC (Within 1,000 Foot Buffer Zone)

BACKGROUND

Hedge Coffee LLC is applying for an Authority to Construct and Permit to Operate for the following equipment:

S-1 Batch Coffee Roaster, Loring S-35 Kestrel, 240 lb/hr Capacity with Integral Cyclone Afterburner, 300,000 Btu/hr

The equipment will be located at 434 Shotwell St., San Francisco, CA 94110.

The Loring coffee roasters use a closed-loop technology to heat the roasting process. A single burner, located in the cyclone, provides the hot air for the roasting chamber and acts as an afterburner, incinerating the process smoke and odor in the recirculated air. This process operates at temperatures of 1200 to 1400 degrees F. The proposed burner is fueled by natural gas.

EMISSION CALCULATIONS

Basis: *Maximum Operating Rate:* 240 lbs/hr
Hours of Operation (52 weeks/yr, 3 days/week, 6 hrs/day): 936 hrs/yr
Coffee Throughput: 224,640 lbs/yr
Roaster Firing Rate: 0.30 MMBtu/hr
Yearly Fuel Throughput: 280.80 MMBtu/yr
Heat Capacity: 1,020 MMBtu/MMscf natural gas

Criteria pollutant originate from the source S-1, batch roasting [1] and gas combustion [2]. A summary of the emissions from batch roasting and gas combustion is given in Table 1.

Table 1. Emissions from Roasting Operation and Natural Gas Combustion for Source S-1

Pollutant	Roasting Operation			Natural Gas Combustion			Total
	Green Bean Throughput (TPY)	Emission Factor [1] (lb/ton)	Emission Rate (lb/yr)	Fuel Usage (MMscf/yr)	Emission Factor [2] (lb/MMscf)	Emission Rate (lb/yr)	Emission Rate (lb/yr)
NO_X	N/A			0.2753	100.0	27.53	27.53
POC	112.32	0.047	5.28	0.2753	5.5	1.51	6.79
CO	112.32	0.55	61.78	0.2753	84.0	23.12	84.90
PM_{10}	112.32	0.207	23.25	0.2753	7.6	2.09	25.34
SO_2	N/A			0.2753	0.6	0.17	0.17
Methane	N/A			0.2753	2.3	0.63	0.63

[1] Emission factors (batch roaster with thermal oxidizer and continuous cooler with cyclone) for emissions of particulate and organics are taken from AP-42 Table 9.13.2-1 and Table 9.13.2-2.

[2] Emission factors for NO_X and CO taken from AP-42 1.4-1 for small boilers (<100 MMBtu/hr). Emissions factor for SO_2, PM_{10}, POC and NPOC (Methane) taken from AP-42 Table 1.4-2.

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[1] Filterable PM from batch roaster with thermal oxidizer (0.12 lb/ton), continuous cooler with cyclone (0.028 lb/ton), and green coffee bean screening, handling, and storage system with fabric filter (0.059 lb/ton)
[2] AP-42 Chapter 1.4 Natural Gas Combustion

Toxic Risk Screening

Both coffee roasting and gas combustion produce TAC emissions. According to Chapter 9.13.2 of AP-42, Coffee Roasting, the roaster is the main source of gaseous pollutants, including aldehydes and acrolein. However, the California Air Resources Board (CARB) 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 Air District is not evaluating risk for acrolein. There are no California Air Toxic Emission Factors (CATEF) factors for the aldehydes from coffee roasting. However, source testing was performed at Peet's Coffee and Tea, Inc. and their determined toxic emission factors are used in this calculation.

BAAQMD Toxic Air Contaminant (TAC) Emission Factor Guideline [3] (Appendix A, Default TAC Emission Factors for Specific Source Categories, Table A-1.1), dated August 2020, was referenced for the roaster's natural gas TAC emission factors (Acetaldehyde, Benzene, Formaldehyde, and Toluene).

Table 2. TAC Emissions from Roasting Operation and Natural Gas Combustion, for S-1

TAC	Roasting Operation			Natural Gas Combustion			Total
	Green Bean Throughput (TPY)	Emission Factor (lb/ton)	Emission Rate (lb/yr)	Fuel Usage (MMBtu/yr)	Emission Factor (lb/MMscf)	Emission Rate (lb/yr)	Emission Rate (lb/yr)
Acetaldehyde	112.32	0.0005	0.0562	280.8	4.22E-06	0.0012	0.0573
Acrolein				280.8	2.65E-06	0.0007	0.0007
Arsenic				280.8	1.96E-07	0.0001	0.0001
Benzene				280.8	7.84E-06	0.0022	0.0022
Beryllium				280.8	5.88E-09	0.0000	0.0000
Cadmium				280.8	1.08E-06	0.0003	0.0003
Copper				280.8	8.33E-07	0.0002	0.0002
Ethylbenzene				280.8	9.31E-06	0.0026	0.0026
Formaldehyde	112.32	0.0008	0.0899	280.8	2.17E-04	0.0609	0.1508
n-Hexane				280.8	6.18E-06	0.0017	0.0017
Lead				280.8	4.90E-07	0.0001	0.0001
Manganese				280.8	3.73E-07	0.0001	0.0001
Mercury				280.8	2.55E-07	0.0001	0.0001
Naphthalene				280.8	5.98E-07	0.0002	0.0002
Nickel				280.8	2.06E-06	0.0006	0.0006
PAH*				280.8	6.60E-09	0.0000	0.0000
Propylene				280.8	7.17E-04	0.2013	0.2013
Selenium				280.8	1.18E-08	0.0000	0.0000
Toluene				280.8	3.59E-05	0.0101	0.0101
Vanadium				280.8	2.25E-06	0.0006	0.0006

[3] https://www.baaqmd.gov/~/media/files/ab617-community-health/facility-risk-reduction/documents/tac_emission_factor_guidance_appendixa_august_2020-pdf.pdf?la=en

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Xylenes				280.8	2.67E-05	0.0075	0.0075

* As benzo(a) pyrene equivalent.

Project Potential to Emit

Table 3 summarizes the criteria pollutant and TAC emissions from the new source S-1.

Table 3. New Source (S-1) Potential to Emit Review

Pollutant		Calculated Emissions			
		lb/hr	*lb/day*	*lb/yr*	*tons/yr*
Criteria Pollutants	**NO_X**	0.0294	0.176	27.53	0.014
	POC	0.0073	0.044	6.79	0.003
	CO	0.0907	0.544	84.90	0.042
	PM_{10}	0.0271	0.162	25.34	0.013
	SO_2	0.0002	0.001	0.17	0.000
	Methane	0.0007	0.004	0.63	0.000
Toxic Air Contaminants (TACs)	**Acetaldehyde**	6.13E-05	3.68E-04	5.73E-02	2.87E-05
	Acrolein	7.95E-07	4.77E-06	7.44E-04	3.72E-07
	Arsenic	5.88E-08	3.53E-07	5.50E-05	2.75E-08
	Benzene	2.35E-06	1.41E-05	2.20E-03	1.10E-06
	Beryllium	1.76E-09	1.06E-08	1.65E-06	8.26E-10
	Cadmium	3.24E-07	1.94E-06	3.03E-04	1.52E-07
	Copper	2.50E-07	1.50E-06	2.34E-04	1.17E-07
	Ethylbenzene	2.79E-06	1.68E-05	2.61E-03	1.31E-06
	Formaldehyde	1.61E-04	9.67E-04	1.51E-01	7.54E-05
	n-Hexane	1.85E-06	1.11E-05	1.74E-03	8.68E-07
	Lead	1.47E-07	8.82E-07	1.38E-04	6.88E-08
	Manganese	1.12E-07	6.71E-07	1.05E-04	5.24E-08
	Mercury	7.65E-08	4.59E-07	7.16E-05	3.58E-08
	Naphthalene	1.79E-07	1.08E-06	1.68E-04	8.40E-08
	Nickel	6.18E-07	3.71E-06	5.78E-04	2.89E-07
	PAH	1.98E-09	1.19E-08	1.85E-06	9.27E-10
	Propylene	2.15E-04	1.29E-03	2.01E-01	1.01E-04
	Selenium	3.54E-09	2.12E-08	3.31E-06	1.66E-09
	Toluene	1.08E-05	6.46E-05	1.01E-02	5.04E-06
	Vanadium	6.75E-07	4.05E-06	6.32E-04	3.16E-07
	Xylenes	8.01E-06	4.81E-05	7.50E-03	3.75E-06

Plant Cumulative Emissions

Project located at 434 Shotwell St., San Francisco, CA 94110 is a new facility. Therefore, there are no existing emissions at the plant. Table 4 summarizes the cumulative increase in criteria pollutant emissions that will result from the operation of S-1.

Table 4. Cumulative Emissions Increase (TPY)

Pollutant	Existing	New	Total
NO_X	0.000	0.014	0.014
POC	0.000	0.003	0.003
CO	0.000	0.042	0.042

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PM_{10}	0.000	0.013	0.013
SO_2	0.000	0.000	0.000

HEALTH RISK ASSESSMENT

Table 5 summarizes the TAC emissions associated with the current application in comparison with the respective HRA trigger levels set forth in BAAQMD Regulation 2-5, Table 1. All TAC emissions are below the respective trigger levels. Therefore, an HRA is not required.

Table 5. Proposed TAC Emissions vs. HRSA Trigger Levels for the Project

TAC	Total Net Emissions		Trigger Levels		HRSA Triggered?
	Hourly (lb/hr)	Annual (lb/yr)	Acute (lb/hr)	Chronic (lb/yr)	(Yes/No)
Acetaldehyde	6.13E-05	5.73E-02	2.10E-01	2.90E+01	No
Acrolein	7.95E-07	7.44E-04	1.10E-03	3.00E+01	No
Arsenic	5.88E-08	5.50E-05	8.80E-05	3.10E+01	No
Benzene	2.35E-06	2.20E-03	1.20E-02	3.20E+01	No
Beryllium	1.76E-09	1.65E-06	N/A	3.30E+01	No
Cadmium	3.24E-07	3.03E-04	N/A	3.40E+01	No
Copper	2.50E-07	2.34E-04	4.40E-02	3.50E+01	No
Ethylbenzene	2.79E-06	2.61E-03	N/A	3.60E+01	No
Formaldehyde	1.61E-04	1.51E-01	2.40E-02	3.70E+01	No
n-Hexane	1.85E-06	1.74E-03	N/A	3.80E+01	No
Lead	1.47E-07	1.38E-04	N/A	3.90E+01	No
Manganese	1.12E-07	1.05E-04	N/A	4.00E+01	No
Mercury	7.65E-08	7.16E-05	2.70E-04	4.10E+01	No
Naphthalene	1.79E-07	1.68E-04	N/A	4.20E+01	No
Nickel	6.18E-07	5.78E-04	8.80E-05	4.30E+01	No
PAH	1.98E-09	1.85E-06	N/A	4.40E+01	No
Propylene	2.15E-04	2.01E-01	N/A	4.50E+01	No
Selenium	3.54E-09	3.31E-06	N/A	4.60E+01	No
Toluene	1.08E-05	1.01E-02	2.20E+00	4.70E+01	No
Vanadium	6.75E-07	6.32E-04	1.30E-02	4.80E+01	No
Xylenes	8.01E-06	7.50E-03	9.70E+00	4.90E+01	No

GRAIN LOADING RATE

Regulation 6-1-310: Particulate Weight Limitation, states that any source may not emit matter in excess of 0.15 grain/dscf of exhaust gas volume.

Basis: *Operating hours:* 936 hrs/yr
Roaster emission point: 450 dscfm at 1,400 degrees F

[(0.02778 lb PM_{10}/hr) × (7000 grain/lb)] / [(60 min/hr) × (450 dscfm)] = 0.0072 grain/dscf

Therefore, S-1 does not emit particulate matter more than 0.15 grain/dscf and complies with Regulation 6-1-310.

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BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

In accordance with Regulation 2-2-301, 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, SO_2 or PM_{10}.

Based on the emissions displayed in Table 3, BACT is not triggered for any pollutant since the maximum daily emissions of each pollutant does not exceed 10 lbs/day.

OFFSETS

Per Regulation 2-2-302, offsets must be provided for any new or modified source at a facility that emits more than 10 tons/yr of POC or NOx. Based on the emissions displayed in Table 3, offsets are not required for this application.

NEW SOURCE PERFORMANCE STANDARDS (NSPS)

S-1 is not affected by any subpart of 40 CFR Part 60.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)

S-1 is not affected by any subpart of 40 CFR Part 63.

STATEMENT OF COMPLIANCE

Source S-1 will comply with Regulation 6, Rule 1, since its estimated particulate emissions of 7.2×10^{-3} grain/dscf is less than the limit of 0.15 grains/dscf.

The project is ministerial under the District's CEQA 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 emissions factors and therefore is not discretionary as defined by CEQA. (Permit Handbook Chapter 2.3.1)

A new or modified source located within 1,000 feet of the outer boundary of a K-12 school site which results in the increase in emissions of a toxic air contaminant in Table 2-5-1 of *Regulation 2, Rule 5 New Source Review of Toxic Air Contaminants* shall prepare and distribute a public notice in accordance with subsections 412.1 and 412.2 of *Regulation 2, Rule 1 General Requirements.*

This application proposes a new source of TACs which is located within 1,000 feet of the outer boundary of La Scuola International School (Italian)| Elementary and Middle School (5 - 14 years), at 3250 18th St., San Francisco, CA 94110, and John O'Connell Technical High School, at 2355 Folsom St, San Francisco, CA 94110. Therefore, public notification pursuant to Reg. 2-1-412 is triggered.

A public notice was prepared and sent to all addresses (residential and business neighbors) within 1000 feet of the coffee roaster and parents and guardians of students at La Scuola International School (Italian)| Elementary and Middle School and John O'Connell Technical High School. The public comment period lasted from Month day to Month day, 2023. During this period, the Air District received ……...

To be completed

PSD does not apply.

PERMIT CONDITIONS

Condition #00000 ----------

1. The owner/operator shall not roast more green coffee beans than the following, in any consecutive 12-month period:

   Coffee Roaster, S-1: 224,640 pounds

   [Basis: Cumulative Increase]

2. The owner/operator shall abate S-1 Coffee Roasters at all times while operating by the built-in afterburner.
   [Basis: Cumulative Increase]

3. The owner/operator shall maintain a minimum furnace temperature of 1200° F and maintain a residence time of at least 0.4 seconds.
   [Basis: Regulation 2-1-403]

4. The owner/operator shall ensure that the afterburners are equipped with temperature-measuring devices 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]

5. The owner/operator shall not emit from any source for a 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 or of such opacity as to obscure an observer's view to an equivalent or greater degree.
   [Basis: BACT]

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 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 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]

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RECOMMENTATION

Issue Authority to Construct and Permit to Operate to Ohm Coffee Roaster for the following equipment:

S-1 Batch Coffee Roaster, Loring S-35 Kestrel, 240 lb/hr Capacity with Integral Cyclone Afterburner, 300,000 Btu/hr

By: _____ Date: 3/7/2023

Sadegh Sadeghipour
Air Quality Engineer

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