

**DRAFT ENGINEERING EVALUATION
IST, INC. (HOME COFFEE ROASTERS)
PLANT NO. 24092 APPLICATION NO: 29147**

BACKGROUND

Ist, Inc. (Home Coffee Roasters) of San Francisco, CA is applying for an Authority to Construct and/or Permit to Operate for the following equipment:

- S-1 Batch Coffee Roaster; Maker: Probat; Model: UG-22; Maximum Roasting Capacity: 145.5 lbs/hr; Maximum Firing Rate: 150,000 btu/hr; Abated by A-1 followed by A-2**
- A-1 Dynamic Cyclone; Maker: Probat;**
- A-2 Coffee Roaster Afterburner; Maker: USRC; Model: 30 cubic feet model; Maximum Firing Rate: 550,000 btu/hr**

S-1 Batch Coffee Roaster will be located 2018 Clement Street, San Francisco, CA and will be abated by A-1 Cyclone followed by A-2 Coffee Roaster Afterburner to eliminate smoke and precursor organic compounds (POC) generated during the roasting process. The principal emissions from coffee roasting processes are particulate matter (PM), POC, and combustion products. Emissions of carbon monoxide (CO) and nitrogen oxides (NO_x) are expected as a result of combustion of natural gas. The coffee roaster will be within 1,000 feet of the property boundary of Alamo Elementary School and St. Monica School.

EMISSIONS CALCULATIONS

NO_x, CO, and POC emissions can vary depending on the type of roast (e.g. light or dark roast), bean origin, and the roast duration. Thus, to account for the variation, the staff propose setting NO_x and CO emissions from S-1 to 9 lbs/day for this application to allow for a conservative estimate of NO_x and CO emissions and allow for a compliance margin. The NO_x and CO emission factor calculated based on 9 lbs/day were 13.75 lbs/ton for both NO_x and CO. The NO_x and CO emission factors used for the emissions calculations were compared to the emission factors available in Compilation of Air Pollutant Emission Factors (AP-42), Section 9.13.2 "Coffee Roasting", to ensure that the emission factors were in align with the emission factors available in coffee roasting chapter of AP-42.

For POC emissions calculation, POC emission factor of 0.047 lbs/ton from Table 9.13.2-2 of AP-42 Section 9.13 for batch roasters with thermal oxidizer was used.

For PM emission calculations, the PM emission factor of 0.148 lbs/ton from Table 9.13.2-1 of AP-42 Section 9.13.2, which was obtained by summing emission factor for batch roaster with thermal oxidizer and continuous cooler with cyclone.

The emission factor for sulfur dioxide (SO₂) was based on a source test conducted by Kraft, Inc. (Plant #167, District Test 99126) for a large coffee roaster rated at maximum roasting capacity of 8,250 lbs/hr, which reported a limit of 0.021 lb/ton for SO₂ since no source test data for SO₂ were available for similarly sized coffee roaster. For the SO₂ emissions calculations, the emission factor was raised to a conservative value of 0.05 lbs/ton.

For acetaldehyde and formaldehyde emissions, the acetaldehyde and formaldehyde emissions from S-1 will be limited to 90% of the annual trigger levels to allow for a compliance margin above the source test results from other coffee roasters. The acetaldehyde and formaldehyde emission factors calculated based on 90% of the annual trigger level were 0.18 and 0.09 lbs/ton, respectively.

Basis:

- Maximum Hourly Roaster Throughput: 145.5 lb/hr
- Annual Hours of Operation: 2,000 hrs/yr
- Maximum Daily Hours of Operation: 9 hrs/day
- Annual Throughput Limit: 290,100 lb/yr (146 tons/yr)
- Daily Throughput Limit: 1,310 lb/day (0.66 tons/day)
- Roaster Maximum Firing Rate: 0.7 MMbtu/hr
- Annual Fuel Throughput Limit: 1,400 MMbtu/yr (1,373,000 scf/yr)
- Daily Fuel Throughput Limit: 6.3 MMbtu/day (6,177 scf/day)
- Heat Capacity of Natural Gas: 1,020 MMbtu/MMscf

Table 1- Emission Factors for S-1

Pollutant	E.F. (lbs/ton)	Source of E.F.
NO _x	13.75	Best Available Control Technology (BACT) avoidance and AP-42 Section 9.13
CO	13.75	BACT avoidance and AP-42 Section 9.13
POC	0.047	AP-42 Section 9.13 – Table 9.13.2-2 – Batch Roaster with Thermal Oxidizer E.F.
PM ₁₀ *	0.148	AP-42 Batch Roaster with Thermal Oxidizer - Filtrable PM + Continuous cooler with Cyclone - Filterable PM
PM _{2.5} *	0.148	AP-42 Batch Roaster with Thermal Oxidizer - Filtrable PM + Continuous cooler with Cyclone - Filterable PM
SO ₂	0.05	Kraft Source Test Result, District Test 99126 12/17/98
Acetaldehyde	0.179	Health Risk Assessment (HRA) avoidance
Formaldehyde	0.087	HRA avoidance

*Since AP-42 document did not specify the particle diameter for the PM emission factors, the District staff assumed that the emission factors were for PM with diameter less than 2.5 micron for a conservative estimate of PM emissions.

Emissions using emission factors from Table 1 are calculated in Table 2 below.

Table 2 – Annual, Daily, and Hourly Emissions from S-1

Pollutant	Emissions			
	(lbs/hr)	(lbs/day)	(lbs/yr)	(TPY)
NO _x	1.00	9.00	2007.5	1.004
CO	1.00	9.00	2007.5	1.004
POC	0.00	0.03	6.84	0.003
PM ₁₀	0.01	0.10	21.53	0.011
PM _{2.5}	0.01	0.10	21.53	0.011
SO ₂	0.00	0.03	7.27	0.004
Acetaldehyde	0.01	0.12	26.10	0.013
Formaldehyde	0.01	0.06	12.60	0.006

Plant Cumulative Increase

Table 3 summarizes the cumulative increase in criteria pollutant emissions that will result from the operation of S-1.

Table 3. Plant Cumulative Emissions

Pollutant	Existing	New	Total
NO _x	0.000	1.004	1.004
CO	0.000	1.004	1.004
POC	0.000	0.003	0.003
PM ₁₀	0.000	0.011	0.011
PM _{2.5}	0.000	0.011	0.011
SO ₂	0.000	0.004	0.004

TOXIC RISK SCREENING

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 District is not evaluating risk for acrolein. There are no California Air Toxic Emission Factors (CATEF) factors for the aldehydes from coffee roasting.

According to Regulation 2, Rule 5, the chronic and acute trigger levels for acetaldehyde are 29 lbs/yr and 1 lbs/hr, respectively. The chronic and acute trigger levels for formaldehyde are 14 lbs/yr and 0.12 lbs/hr, respectively. Acetaldehyde and formaldehyde emissions from S-1 are summarized in Table 2. The emission rates for formaldehyde and acetaldehyde, as presented in Table 2, do not exceed the trigger levels. Therefore, a health risk screen is not required.

BEST AVAILABLE CONTROL TECHNOLOGY

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, SO₂, PM₁₀, or PM_{2.5}. Based on the emissions in Table 2, S-1 does not trigger BACT.

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 NO_x. Based on the emissions displayed in Table 2, 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

Regulation 1 - General Provisions and Definitions

Regulation 1-301 prohibits discharging emissions in quantities that cause injury, detriment, nuisance or annoyance. The facility is expected to comply with this requirement.

Regulation 2, Rule 1 – General Requirements

The green bean handling at the facility is considered exempt per Regulation 2-1-117.6. The facility handles less than 1000 tons per year of green coffee, since the green bean is considered a dry food product.

This application is considered to be ministerial under the District's CEQA guidelines (Regulation 2-1-311) and therefore is not subject to California Environmental Quality Act (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 for similarly sized equipment.

Regulation 3 - Fees

This regulation requires payment of filing, initial, permit, and public noticing fees. The facility complied with this requirement.

Regulation 6, Rule 1 - Particulate Matter and Visible Emissions

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.

Compliance with Regulation 6-1-310 Particulate Weight Limitation

Exhaust Air Flowrate = 400 acfm at 1200 °F (1,660 °R), 10% water vapor content by volume
 Adjusted Air Flowrate to Standard Temperature (528 °R) = (400 acfm) (528 °R / 1,660 °R)
 = 127 scfm

Exhaust Air Flowrate - Dry = (127 scfm) (90%) = 114 dscfm
 (21.53 lb PM₁₀/yr) (7,000 grains/lb) / [(114 dscfm) (60 min/hr) (2,000 hr/yr)] = 0.011 grain/dscf

Since the grain loading from the exhaust of S-1 is less than 0.15 grain per dry standard cubic feet, S-1 complies with the particulate weight limitation set forth in Regulation 6-1-310.

Compliance with Regulation 6-1-311 General Operations

Allowable Rate of PM₁₀ Emissions = 4.10 (0.073 tons/hr)^{0.67} = 0.71 lbs/hr
 Hourly PM₁₀ Emission Rate from S-1 = 0.011 lbs/hr

Since the hourly emission from S-1 is less than the allowable emission calculated, S-1 complies with the PM discharge limit set forth in Regulation 6-1-311.

Regulation 7 - Odorous Substances

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

PERMIT CONDITIONS

Application #29147: Ist, Inc. (Home Coffee Roasters): Plant #24092: Conditions for S-1

PC 26761

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

S-1	146 tons/yr of green beans
Natural Gas Usage	1,373,000 scf/yr

 [Basis: Cumulative Increase]

2. The owner/operator shall not exceed the following limits at the sources indicated over any consecutive 24-hour period:

S-1	0.65 tons/day of green beans
Natural Gas Usage	6,177 scf/day

 [Basis: Cumulative Increase]

3. The owner/operator shall not exceed the following limits while operating S-1:

NO _x	13.75 pounds per ton of green bean roasted
CO	13.75 pounds per ton of green bean roasted
POC	0.047 pounds per ton of green bean roasted
PM	0.148 pounds per ton of green bean roasted
Acetaldehyde	0.179 pounds per ton of green bean roasted
Formaldehyde	0.087 pounds per ton of green bean roasted

 [Basis: Cumulative Increase, BACT Avoidance]

4. The owner/operator of S-1 Batch Coffee Roaster 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: Regulation 6-1]

5. The owner/operator of S-1 Batch Coffee Roaster shall ensure that S-1 Coffee Roaster is abated at all times of roasting by properly maintained and properly operated A-1 Dynamic Cyclone followed by A-2 Coffee Roaster Afterburner. [Basis: Cumulative Increase]

6. The owner/operator shall maintain a minimum furnace temperature of 1200° F at A-2 Coffee Roaster Afterburner and maintain a residence time of at least 0.3 seconds. [Basis: Regulation 2-1-403]

7. The owner/operator shall ensure that A-2 Coffee Roaster 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 6. [Basis: Regulation 1-521, 1-523]

8. The permit to operate is contingent upon compliance with Regulation 1-301, Standard for Public Nuisance, and Regulation 7, Odorous Substances. Upon receipt of a notice of violation or notice to comply for either of these regulations, the owner/operator of S-1 Coffee Roaster shall submit, within 30 days of the date of issuance of this notice of violation or notice to comply, a permit application for an Authority to Construct for additional emissions control equipment. [Basis: Regulation 1-301, 7-301, 7-302, 7-303]

9. 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 and daily records of the quantity of green coffee beans roasted at S-1 Batch Coffee Roaster.

- b. Monthly and daily records of natural gas usage.
- c. Monthly usage records shall be totaled for each consecutive 12-month period.
- d. Continuous temperature measurement data
- e. Source test report data or any other emissions test data.

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 Batch Coffee Roaster; Maker: Probat; Model: UG-22; Maximum Roasting Capacity: 145.5 lbs/hr; Maximum Firing Rate: 150,000 btu/hr; Abated by A-1 followed by A-2**
- A-1 Dynamic Cyclone; Maker: Probat;**
- A-2 Coffee Roaster Afterburner; Maker: USRC; Model: 30 cubic feet model; Maximum Firing Rate: 550,000 btu/hr**

By: _____
 Alexander Sohn
 Air Quality Engineer

Date: _____

