

**ENGINEERING EVALUATION  
 CAFE SANTANA ROASTING COMPANY  
 PLANT NO. 23973 APPLICATION NO: 28913**

**BACKGROUND**

Cafe Santana Roasting Company of Oakland, CA is applying for an Authority to Construct and/or Permit to Operate for the following equipment:

- S-1 San Franciscan Roaster Coffee Roaster; Model: SF-25; Maximum Roasting Capacity: 100 lb/hr; Maximum Firing Rate: 100,000 btu/hr; Abated by A-1**
- A-1 San Franciscan Afterburner; Model: SF-25; Maximum Firing Rate: 250,000 btu/hr;**

The coffee roaster S-1 will be located at 4100 MacArthur Blvd, Oakland 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<sub>x</sub>) are expected as a result of combustion of natural gas. The coffee roaster will be within 1,000 feet of the property boundary of Cornerstone Christian Academy, St. Lawrence O’toole Elementary School, and Laurel Elementary School.

**Basis:**

- Maximum Roaster Throughput: 100 lb/hr
- Hours of operation: 100 hr/yr
- Annual Throughput: 10,000 lb/yr (5 tons/yr)
- Roaster Maximum Firing Rate: 0.10 MMbtu/hr
- Afterburner Maximum Firing Rate: 0.25 MMbtu/hr
- Total Fuel Throughput: 0.35 MMbtu/hr
- Yearly Fuel Throughput: 35 MMbtu/yr (34,000 scf/yr)
- Heat Capacity of Natural Gas: 1,020 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 (btu/scf) | Pollutant       | Emission Factor (lb/MMscf) | Maximum Daily Emission (lb/day) | Annual Emission (lb/yr) | Annual Emission (TPY) |
|----------------------------|----------------------------------|------------------------------|-----------------|----------------------------|---------------------------------|-------------------------|-----------------------|
| 100                        | 0.35                             | 1,020                        | NO <sub>x</sub> | 100 <sup>a</sup>           | 1.37                            | 3.43                    | 0.002                 |
|                            |                                  |                              | CO              | 84 <sup>a</sup>            | 1.15                            | 2.88                    | 0.001                 |
|                            |                                  |                              | POC             | 5.5 <sup>b</sup>           | 0.08                            | 0.19                    | 0.000                 |
|                            |                                  |                              | PM              | 7.6 <sup>b</sup>           | 0.10                            | 0.26                    | 0.000                 |
|                            |                                  |                              | SO <sub>2</sub> | 0.6 <sup>b</sup>           | 0.01                            | 0.02                    | 0.000                 |
|                            |                                  |                              | CH <sub>4</sub> | 2.3 <sup>b</sup>           | 0.03                            | 0.08                    | 0.000                 |

<sup>a</sup> From EPA AP-42 Table 1.4-1

<sup>b</sup> 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) |
|----------------------------|------------------------------------|-----------|--------------------------|-------------------------|-----------------------|
| 100                        | 100                                | CO        | 0.55 <sup>a</sup>        | 2.75                    | 0.001                 |
|                            |                                    | POC       | 0.047 <sup>a</sup>       | 0.24                    | 0.000                 |
|                            |                                    | PM        | 0.148 <sup>a</sup>       | 0.74                    | 0.000                 |

<sup>a</sup> 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/day) | Total Annual Emissions (lb/yr) | Total Emissions (TPY) |
|-----------------|--|---------------------------------------|--------------------------------|--------------------------------|-----------------------|
| NO <sub>x</sub> | 3.43                                   | 0.00                                  | 0.82                           | 3.43                           | 0.002                 |
| CO              | 2.88                                   | 2.75                                  | 1.35                           | 5.63                           | 0.003                 |
| POC             | 0.19                                   | 0.24                                  | 0.10                           | 0.43                           | 0.000                 |
| PM              | 0.26                                   | 0.74                                  | 0.24                           | 1.00                           | 0.001                 |
| SO <sub>2</sub> | 0.02                                   | 0.00                                  | 0.00                           | 0.02                           | 0.000                 |
| CH <sub>4</sub> | 0.08                                   | 0.00                                  | 0.02                           | 0.08                           | 0.000                 |

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 <sub>x</sub> | 0.000                    | 0.002              | 0.002                     |
| CO              | 0.000                    | 0.003              | 0.003                     |
| POC             | 0.000                    | 0.000              | 0.000                     |
| PM              | 0.000                    | 0.001              | 0.001                     |
| SO <sub>2</sub> | 0.000                    | 0.000              | 0.000                     |
| CH <sub>4</sub> | 0.000                    | 0.000              | 0.000                     |

**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) |
|----------------------------|------------------------------------|--------------|--------------------------|--------------------------|--------------------------|
| 100                        | 100                                | Acetaldehyde | 5.00E-04                 | 2.50E-05                 | 2.50E-03                 |
|                            |                                    | Formaldehyde | 8.00E-04                 | 4.00E-05                 | 4.00E-03                 |

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

**Table 6. TAC Emissions from Natural Gas Combustion**

| Hours of Operation (hr/yr) | Total Fuel Throughput (MMbtu/hr) | Fuel Heat Capacity (btu/scf) | Pollutant    | Emission Factor (lb/MMscf) | Hourly Emission (lb/hr) | Annual Emissions (lb/yr) |
|----------------------------|----------------------------------|------------------------------|--------------|----------------------------|-------------------------|--------------------------|
| 100                        | 0.35                             | 1,020                        | Benzene      | 2.10E-06                   | 7.21E-10                | 7.21E-08                 |
|                            |                                  |                              | Formaldehyde | 7.50E-05                   | 2.57E-08                | 2.57E-06                 |
|                            |                                  |                              | Toluene      | 3.40E-06                   | 1.17E-09                | 1.17E-07                 |

**Table 7. Total TAC Emissions from S-1**

| Pollutant    | Total Hourly Emissions (lb/hr) | Acute Trigger Level (lb/hr) | Total Annual Emissions (lb/yr) | Chronic Trigger Level (lb/yr) | HRA Required? (Y/N) |
|--------------|--------------------------------|-----------------------------|--------------------------------|-------------------------------|---------------------|
| Acetaldehyde | 2.50E-05                       | 1.00E+00                    | 2.50E-03                       | 2.90E+01                      | N                   |
| Benzene      | 7.21E-10                       | 6.00E-02                    | 7.21E-08                       | 2.90E+00                      | N                   |
| Formaldehyde | 4.00E-05                       | 1.20E-01                    | 4.00E-03                       | 1.40E+01                      | N                   |
| Toluene      | 1.17E-09                       | 8.20E+01                    | 1.17E-07                       | 1.20E+04                      | N                   |

Based on calculations presented in Table 7, emissions of TACs for S-1 do not exceed acute or chronic trigger levels set forth in Table 1 of Regulation 2-5; therefore, a toxic 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<sub>x</sub>, CO, SO<sub>2</sub>, PM<sub>10</sub>, or PM<sub>2.5</sub>.

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<sub>x</sub> per Regulation 2-1-302. 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****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), since the review of proposed new source was based on the criteria set forth in Regulation 2-1-428 and based on procedures, fixed standards, and objective measurements outlined in District's Permit Handbook and BACT/TBACT workbook. Thus, this application 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 for similarly sized equipment. In addition, the applicant has submitted a completed Environmental Information Form in Appendix H of the State CEQA Guidelines, since this project also satisfies the CEQA exemption per Regulation 2-1-312.11.4.

**Regulation 3 - Fees**

This regulation requires payment of filing, initial, and permit fees. The facility is expected to comply 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 = 850 acfm at 1200 °F (1,660 °R), 10% water vapor content by volume  
 Adjusted Air Flowrate to Standard Temperature (528 °R) = (850 scfm) (528 °R / 1,660 °R)  
 = 270 scfm

Exhaust Air Flowrate - Dry = (270 scfm) (90%) = 243 dscfm  
 (1 lb PM<sub>10</sub>/yr) (7,000 grains/lb) / [(243 dscfm) (60 min/hr) (100 hr/yr)] = 0.0048 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 Emissions =  $4.10 (0.05 \text{ tons/hr})^{0.67} = 0.55 \text{ lbs/hr}$

Hourly Emission Rate from S-1 =  $1 \text{ lbs/yr} / 100 \text{ hrs/yr} = 0.01 \text{ lbs/hr}$

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 #28913: Cafe Santana Roasting Company: Plant #23973: Conditions for S-1

**PC 26625**

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

|                              |               |
|------------------------------|---------------|
| S-1                          | 5 tons/yr     |
| Natural Gas Usage            | 34,000 scf/yr |
| [Basis: Cumulative Increase] |               |
2. The owner/operator of S-1 Coffee Roaster shall ensure that S-1 Coffee Roaster is abated at all times of roasting by properly maintained and properly operated A-1 Afterburner. [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, 1-523]
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 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. Source Test Reports  
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 San Franciscan Roaster Coffee Roaster; Model: SF-25; Maximum Roasting Capacity: 100 lb/hr; Maximum Firing Rate: 100,000 btu/hr; Abated by A-1**
- A-1 San Franciscan Afterburner; Model: SF-25; Maximum Firing Rate: 250,000 btu/hr;**

By: \_\_\_\_\_

Alexander Sohn  
Air Quality Engineer

Date: \_\_\_\_\_