

**Engineering Evaluation Report
Ubuntu Coffee
5515 Doyle Street, Suite #7
Emeryville, CA 94608
Plant # 21090
Application # 24064**

I. BACKGROUND

Ubuntu Coffee wants to operate a coffee roasting facility in Emeryville. They are applying for an Authority to Construct and Permit to Operate for the following equipment:

S-1 Coffee Roaster, Probat L-5, 44 pounds per hour equipped with cyclone, abated by A-1, Thermal Oxidizer, equipped with Polidoro Model NP burner

The batch coffee roaster is complete with a cyclone separator designed as a separate chamber after the roaster. This cyclone separator 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.

The applicant will operate the roaster 250 days per year and indicates a projected green bean throughput of 100 tons per year

II. EMISSION CALCULATIONS

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

Basis:

- Coffee Throughput = 200,000 lb/yr = 100 tons/yr
- Operation hours = 200,000 lbs/yr/44 lb/hr = 4545.45 hours/yr
- Roaster Firing Rate = 70,000 BTU/hr
- Afterburner Firing Rate = 70,000 BTU/hr
- Total fuel throughput = (70,000 +70,000 BTU/hr)(4545.45 hr/yr) = 636.36 MMBTU/yr of natural gas.
- Heat capacity = 1,050 MMBtu/10⁶ ft³ natural gas
- A-1 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
 - NO_x = (100 lb/ MMscf)/(1050 MMBtu/10⁶ ft³) = 0.095 lb/MMBtu
 - CO = (84 lb/ MMscf)/(1050 MMBtu/10⁶ ft³) = 0.08 lb/MMBtu
 - SO₂ = (0.6 lb/MMscf)/(1050 MMBtu/10⁶ ft³) = 5.7 x 10⁻⁴ lb/MMBtu
 - PM₁₀ = (7.6 lb/MMscf)/(1050 MMBtu/10⁶ ft³) = 0.00724 lb/MMBtu
 - POC = (5.5 lb/MMscf)/(1050 MMBtu/10⁶ ft³) = 0.00524 lb/MMBtu
 - NPOC = (2.3 lb/MMscf)/(1050 MMBTU/10⁶ ft³) = 0.00219 lb/MMBtu

Combustion Emission Calculations:

NOx = 636.36 MMBtu/yr X 0.095 lb/MMBtu = 60.45 lb/yr
 CO = 636.36 MMBtu/yr X 0.08 lb/MMBtu = 50.91 lb/yr
 SO2 = 636.36 MMBtu/yr X 0.00057 lb/MMBtu = 0.36 lb/yr
 PM10 = 636.36 MMBtu/yr X 0.00724 lb/MMBtu = 4.61 lb/yr
 POC = 636.36 MMBtu/yr X 0.00524 lb/MMBtu = 3.33 lb/yr,
 NPOC = 636.36 MMBtu/yr X 0.00219 lb/MMBtu = 1.39 lb/yr

All emissions are less than 1 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** | 100 | 0.06 | 0.04 | 14.80 | 0.007 |
| POC (abated) | 0.047 | 100 | 0.02 | 0.01 | 4.70 | 0.002 |

** $(0.12 + 0.028 = 0.148)$ - roaster with abatement equipment and cyclone)

Compliance with Regulation 6

Regulation 6-310 Particulate Weight Limitation:

Basis: 1 hour of roaster operation
 roaster emission point: 1452 acfm @ 1250 degrees F
 450 scfm @ 70 degrees F
 Limitation of 0.15 grain/dscf

Grain Loading calculation from coffee roasting process:

$[19.41 \text{ lb PM}_{10}/\text{yr} \times 7000 \text{ grain/lb}] / [60 \text{ min/hr} \times 4545.45 \text{ hr/yr} \times 450 \text{ dscfm}] = 0.001 \text{ grain/dscf}$.

III. PLANT CUMULATIVE INCREASE

Ubuntu Coffee (Plant No. 21090) is a new facility. Therefore, the District's database does not contain information on existing (permitted) emissions at the plant. The table below summarizes the cumulative increase in criteria pollutant emissions that will result at Plant 21090 from the operation of S-1.

| Pollutant | Existing Tons/year | New Tons/year | Annual Emissions Tons/year |
|-----------|--------------------|---------------|----------------------------|
| NOx | 0 | 0.030 | 0.030 |
| CO | 0 | 0.025 | 0.025 |
| SO2 | 0 | <0.001 | <0.001 |

| | | | |
|------|---|--------|--------|
| PM10 | 0 | 0.010 | 0.010 |
| POC | 0 | 0.004 | 0.004 |
| NPOC | 0 | <0.001 | <0.001 |

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 | 100 | 0.08 | Neg. | 0.21 | 30 |
| Acetaldehyde | 0.0005 | 100 | 0.05 | -- | -- | 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 NOx emissions do not exceed 10 ton/yr.

VII. CEQA REVIEW

This application is considered to be 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 emission factors in accordance with Permit Handbook Chapter 11.3.

VIII. STATEMENT OF COMPLIANCE

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

NSPS, PSD, and NESHAPS are not triggered.

Ubuntu Coffee is within 1000 feet of the following school:

***Pacific Rim International
5521 Doyle Street
Emeryville, CA 95608
Phone # 510-601-1500
School Enrollment: 19
Grades: K-6***

Ubuntu Coffee is subject to the public notification requirements of Regulation 2-1-412. A public notice will be prepared and posted on the Internet and mailed to all parents and guardians of students enrolled at Pacific Rim International School. In addition, public notices will be mailed to all residential neighbors located within 1000 feet of Ubuntu Coffee's facility.

IX. CONDITIONS # 25177

- 1. The owner/operator shall not roast more than 100 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 Part 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 owner/operator to abide by one or more of the following:**
 - a. Submit within 60 days of notification by the APCO, a permit application for an Authority to Construct additional emission control.**
 - b. Adjust the minimum temperature specified in Part 3.**
 - c. 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 an Authority to Construct be granted to Ubuntu Coffee:

- S-1 Coffee Roaster, Probat L-5, 44 pounds per hour equipped with cyclone, abated by A-1, Thermal oxidizer, equipped with Polidoro Model NP burner**

By: _____
Nancy Yee
Senior Air Quality Engineer

Date