



TECHNICAL SUPPORT DOCUMENT

BREWED AWAKENINGS

SWCAA ID: 2354

Air Discharge Permit 10-2934

Air Discharge Permit Application CL-1914

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Abbreviations

ADP	Air Discharge Permit
AP-42	<u>Compilation of Emission Factors, AP-42, Fifth Edition, Volume 1, Stationary Point and Area Sources – published by the US Environmental Protection Agency</u>
BACT	Best available control technology
BART	Best Available Retrofit Technology
Btu	British thermal unit
CFR	Code of Federal Regulations
CO	Carbon monoxide
EPA	U.S. Environmental Protection Agency
HAP	Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act
LAER	Lowest achievable emission rate
lb/MMscf	Pounds per million standard cubic feet
MMBtu/hr	Millions of British thermal units per hour
NO _x	Nitrogen oxides
PM	Total particulate matter (includes both filterable particulate matter measured by EPA Method 5 and condensable particulate matter measured by EPA Method 202)
PM ₁₀	Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (includes both filterable particulate matter measured by EPA Method 201 or 201A and condensable particulate matter measured by EPA Method 202)
PM _{2.5}	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (includes both filterable particulate matter measured by EPA Method 201 or 201A and condensable particulate matter measured by EPA Method 202)
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology
SQER	Small Quantity Emission Rate listed in WAC 173-460
SO ₂	Sulfur dioxide
SWCAA	Southwest Clean Air Agency
TAP	Toxic air pollutant pursuant to Chapter 173-460 WAC
T-BACT	Best Available Control Technology for toxic air pollutants
tpy	Tons per year
VOC	Volatile organic compound
WAC	Washington Administrative Code

1. FACILITY IDENTIFICATION

Applicant Name: Brewed Awakenings Coffee Company
Applicant Address: 6500 NE 117th Avenue, Vancouver, WA 98662

Facility Name: Brewed Awakenings Coffee Company
Facility Address: 16318 SE 12th Street, Vancouver, WA 98683
SWCAA Identification: 2354
Contact Person: Todd Gunderson

Primary Process: Coffee Roasting
SIC/NAICS Code: 5499 / 445299

2. FACILITY DESCRIPTION

Brewed Awakenings Coffee Company is a corporation with multiple stores that specializes in the retail sale of specialized coffee. Brewed Awakenings Coffee Company currently roasts coffee in Suite 201 at the Eastridge Business Park. This location is used only for roasting and preparation activities and is not a retail sales facility.

3. CURRENT PERMITTING ACTION

This permitting action is in response to Air Discharge Permit application number CL-1914 (ADP Application CL-1914) received April 7, 2010. ADP Application CL-1914 requests approval for the installation and operation of a new coffee roasting machine. This roaster and roasting location will replace roasting currently conducted at 11800 NE 95th Street #201, Vancouver, WA. The proposed equipment consists of a used roaster and the same afterburner used at 11800 NE 95th Street.

4. PROCESS DESCRIPTION

The coffee roasting process consists of direct fire roasting of clean, green coffee beans until the beans reach the desired color. During the process, moisture is driven off, the beans swell, and chemical changes take place to give the roasted beans their typical color and aroma. During the first half of the roast the beans swell and moisture is given off. At a point about halfway into the roast, the beans reach the first "crack" which is the point where the skin or hull cracks. After the first crack, the roasting beans give off smoke and odors. The beans are roasted until they reach their desired color. After the roast is completed, the beans are dumped into a cooling tray, air is drawn through the beans, and the beans are stirred with a mechanical arm. This air is also directed through the afterburner. After the beans are cooled, they are "de-stoned" to remove unwanted debris and then sent for packaging.

5. EQUIPMENT/ACTIVITY IDENTIFICATION

5.a Coffee Roaster with Afterburner. The following equipment details were available.

Roaster Make / Model:	Probat / UG22
Roaster Capacity:	22 kg/batch (maximum)
Roaster Manufactured:	1963
Roaster Fuel:	Natural Gas
Roaster Heat Capacity:	120,000 Btu/hr full fire (approximate)
Exhaust Flow Rate:	Roaster blower capable of 425 cfm, expected operation is at 300 cfm. Cooling blower capable of 425 cfm – both blowers exhaust simultaneously to the afterburner
Cycle Length:	~15 minutes per roast cycle, ~2-5 minutes between cycles

Afterburner Make / Model: Services and Equipment, Inc. / 1415-14 V.T. (note the nametag is no longer visible)
 Afterburner Burner Make / Model: Maxon / pre-mix blower mixer (PH-330) s/n 19387 – uses an open port burner with electronic igniter after the blower mixer
 Afterburner Burner Capacity: 0.060 – 0.330 MMBtu/hr
 Afterburner Description: ~18" x 18" x 3' (~ 2' of which is hot) rectangular combustion chamber vented to 18" round duct that continues another 3-4' to the ceiling where the control thermocouple is located
 Afterburner Operating Temperature: 1,200 °F (minimum) to 1,400 °F (maximum)
 Afterburner Retention Time: ~0.6 seconds at 1,200 °F
 Stack Description: Not yet built – expected to utilize a round "velocity stack" exhausting vertically and measuring ~18" in diameter, terminating above roof level.

The applicant indicated that the minimum cycle time of the roaster is approximately 17 - 20 minutes (15 minutes of roasting and cooling and 2 – 5 minutes for unloading and loading). Actual roasting times could be significantly longer depending on product specifications.

During the period of greatest emissions, the flow to the afterburner is expected to be ~ 300 cfm. Based on the afterburner dimensions, at an afterburner temperature of 1,200 °F, the afterburner retention time is approximately 0.6 seconds. The blowers on the roaster are capable of pushing more air to the afterburner than can be heated to 1,200 F, therefore care must be taken to assure the capacity of the afterburner is not exceeded during normal operation.

5.b Equipment/Activity Summary.

ID No.	Generating Equipment/Activity	# of Units	Control Equipment/Measures	# of Units
1	Probat Model UG22 Coffee Roaster	1	Afterburner (thermal oxidizer)	1

6. EMISSIONS DETERMINATION

6.a Coffee Roaster with Afterburner. Emissions from the coffee roaster and afterburner consist of volatile organic compounds and particulate matter from the roasting of the coffee, and products of natural gas combustion. Maximum potential emissions were calculated assuming that the roaster is operated 8,760 hours per year at the maximum rate of 22 kg/batch (48.5 lb/batch) with a cycle time of 17 minutes per batch, and that all burners are fired at their combined maximum heat rate of 0.45 MMBtu/hr for 8,760 hours per year.

Roasting Emissions

Heat Rate for Afterburner = 0.330 MMBtu/hr
 Heat Rate for Roaster = 0.120 MMBtu/hr
 Gas Heat Content = 1,020 Btu/scf
 Maximum Roasting Rate = 48.5 lb/batch (22 kilograms)
 Minimum Batch Time = 0.28 hours (15 minutes roasting + 2 minutes for loading/unloading)
 Annual Operation = 8,760 hours
 Maximum Roasting = 749.8 tons per year

Pollutant	Emission Factor lb/ton beans	Annual Emissions		Emission Factor Source
		pounds per year	tons per year	
NO _x	0.515	386	0.19	AP-42 Sec. 1.4 (7/98) 100 lb/MMscf
CO	0.55	412	0.21	AP-42 Sec. 9.13 (9/95)
VOC	0.047	35	0.02	AP-42 Sec. 9.13 (9/95)
SO _x as SO ₂	0.003	2.3	0.00	AP-42 Sec. 1.4 (7/98) 0.6 lb/MMscf
Total PM	0.179	134	0.07	AP-42 Sec. 9.13 (9/95)
PM ₁₀	0.179	134	0.07	AP-42 Sec. 9.13 (9/95)
PM _{2.5}	0.179	134	0.07	AP-42 Sec. 9.13 (9/95)
Formaldehyde ¹	0.039	29	0.01	PSCAA factor
Acetaldehyde ¹	0.007	5.2	0.00	PSCAA factor
Acrolein ¹	0.007	5.2	0.00	PSCAA factor

¹ Emission factors for formaldehyde, acetaldehyde, and acrolein come from testing conducted in the Puget Sound Clean Air Agency jurisdiction at Starbucks in Kent, WA.

Emissions shall be calculated using the emission factors identified above unless new emission factors are provided by the manufacturer or developed through source testing.

6.b Facilitywide Potential Emissions (PTE) Summary.

Pollutant	Potential Annual Emissions
Nitrogen oxides	0.19 tons
Carbon monoxide	0.21 tons
Volatile organic compounds	0.02 tons
Sulfur oxides as sulfur dioxide	0.00 tons
Particulate matter	0.07 tons
PM ₁₀	0.07 tons
PM _{2.5}	0.07 tons
Toxic Air Pollutants	0.00 tons
Hazardous Air Pollutants	0.00 tons

Pollutant	CAS Number	Pollutant Category	Potential Emissions (lbs/yr)	Project Increase (lbs/yr)	WAC 173-460 ¹ SQER (lbs/yr)
Formaldehyde	50-00-0	HAP/TAP A	29	29	20
Acetaldehyde	75-07-0	HAP/TAP A	5.2	5.2	50
Acrolein	107-02-8	HAP/TAP B	5.2	5.2	175

¹ WAC 173-460 as in effect August 21, 1998.

7. REGULATIONS AND EMISSION STANDARDS

Regulations that have been used to evaluate the acceptability of the proposed facility and establish emission limits and control requirements include, but are not limited to, the regulations, codes, or requirements listed below.

- 7.a Revised Code of Washington (RCW) 70.94.141 empowers any activated air pollution control authority to prepare and develop a comprehensive plan or plans for the prevention, abatement and control of air pollution within its jurisdiction. An air pollution control authority may issue such permits as may be necessary to effectuate the purposes of the Washington Clean Air Act [RCW 70.94] and enforce the same by all appropriate administrative and judicial proceedings subject to the rights of appeal as provided in Chapter 62, Laws of 1970 ex. sess.
- 7.b RCW 70.94.152 provides for the inclusion of conditions of operation as are reasonably necessary to assure the maintenance of compliance with the applicable ordinances, resolutions, rules and regulations when issuing a permit for installation and establishment of an air contaminant source.
- 7.c Washington Administrative Code (WAC) 173-460 "Controls for New Sources of Toxic Air Pollutants" requires Best Available Control Technology for toxic air pollutants (T-BACT), identification and quantification of emissions of toxic air pollutants and demonstration of protection of human health and safety.
- 7.d WAC 173-470 "Ambient Air Quality Standards for Particulate Matter" establishes ambient air quality standards for total suspended particulate matter and for particulate matter smaller than 10 microns (PM₁₀), which may not be exceeded more than one day per year.
- 7.e WAC 173-475 "Ambient Air Quality Standards for Carbon Monoxide, Ozone, and Nitrogen Dioxide" establishes ambient air quality standards for carbon monoxide, ozone, and nitrogen dioxide in the ambient air, which shall not be exceeded.
- 7.f SWCAA 400-040 "General Standards for Maximum Emissions" requires all new and existing sources and emission units to meet certain performance standards with respect to Reasonably Available Control Technology (RACT), visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust.
- 7.g SWCAA 400-040(1) "Visible Emissions" requires that no emission of an air contaminant from any emissions unit shall exceed twenty percent opacity for more than three minutes in any one hour at the emission point, or within a reasonable distance of the emission point.
- 7.h SWCAA 400-040(2) "Fallout" requires that no emission of particulate matter from any source shall be deposited beyond the property under direct control of the owner(s) or operator(s) of the source in sufficient quantity to interfere unreasonably with the use and enjoyment of the property upon which the material is deposited.
- 7.i SWCAA 400-040(3) "Fugitive Emissions" requires that reasonable precautions shall be taken to prevent the fugitive release of air contaminants to the atmosphere.

- 7.j SWCAA 400-040(4) "Odors" requires that any person who shall cause or allow the generation of any odor from any source, which may unreasonably interfere with any other property owner's use and enjoyment of their property must use recognized good practices and procedures to reduce these odors to a reasonable minimum.
- 7.k SWCAA 400-040(6) "Sulfur Dioxide" requires that no person shall emit a gas containing in excess of one thousand ppm of sulfur dioxide on a dry basis, corrected to 7% O₂ or 12% CO₂ as required by the applicable emission standard for combustion sources.
- 7.l SWCAA 400-050 "Emission Standards for Combustion and Incineration Units" requires that all provisions of SWCAA 400-040 be met and that no person shall cause or permit the emission of particulate matter from any combustion or incineration unit in excess of 0.23 grams per dry cubic meter (0.1 grains per dry standard cubic foot) of exhaust gas at standard conditions.
- 7.m SWCAA 400-060 "Emission Standards for General Process Units" requires that all new and existing sources not emit particulate matter in excess of 0.1 grains per dry standard cubic foot of exhaust gas.
- 7.n SWCAA 400-070(12) "Coffee Roasters" requires that batch coffee roasters with a capacity of ten pounds or greater of green coffee beans per batch maintain and operate an afterburner that treats all cooling and roasting exhaust. The proposed coffee roaster has a capacity of 48.5 pounds per batch, therefore this regulation applies to this facility. The catalytic oxidizer meets the intent of the rule requiring the installation of an "afterburner".
- 7.o SWCAA 400-110 "New Source Review" requires that an Air Discharge Permit Application be filed with SWCAA, and an Air Discharge Permit be issued by SWCAA, prior to establishment of the new source, emission unit, or modification.
- 7.p SWCAA 400-111 "Requirements for Sources in a Maintenance Plan Area" requires that no approval to construct or alter an air contaminant source shall be granted unless it is evidenced that:
- (1) The equipment or technology is designed and will be installed to operate without causing a violation of the applicable emission standards;
 - (2) Emissions will be minimized to the extent that the new source will not exceed emission levels or other requirements provided in the maintenance plan;
 - (3) Best Available Control Technology will be employed for all air contaminants to be emitted by the proposed equipment;
 - (4) The proposed equipment will not cause any ambient air quality standard to be exceeded; and
 - (5) If the proposed equipment or facility will emit any toxic air pollutant regulated under WAC 173-460, the proposed equipment and control measures will meet all the requirements of that Chapter.

8. RACT/BACT/BART/LAER/PSD/CAM DETERMINATIONS

The proposed equipment and control systems incorporate Best Available Control Technology (BACT) for the types and amounts of air contaminants emitted by the processes as described below:

- 8.b BACT Determination – Coffee Roaster. SWCAA has determined that the use of an afterburner, operating at a temperature of at least 1,200 °F with a retention time of at least 0.5 seconds, to control particulate matter, volatile organic compounds and odorous emissions from the coffee roaster meets the requirements of BACT and T-BACT for this installation. Based on the available emission factors, particulate matter emissions will be less than 0.005 gr/dscf.
- 8.b Prevention of Significant Deterioration (PSD) Applicability Determination. This permitting action will not result in a potential increase in emissions equal to or greater than the PSD thresholds. Therefore, PSD review is not applicable to this action.

- 8.c Compliance Assurance Monitoring (CAM) Applicability Determination. CAM is not applicable to any emission unit at this facility because it is not a major source and is not required to obtain a Part 70 permit.

9. AMBIENT IMPACT ANALYSIS

With the exception of formaldehyde, none of the potential TAP emissions exceeded the applicable Small Quantity Emission Rate (SQER) listed in WAC 173-460 therefore the ambient impact of these TAP emissions is below regulatory concern. Formaldehyde emissions were modeled using EPA's TSCREEN dispersion model and relatively conservative stack parameters (4 meter stack height, 18" diameter, 1,033 degrees Kelvin exhaust, 293 degree Kelvin ambient temperature). The results of the modeling indicate that the maximum modeled impact (22 meters from stack base) is 0.018 $\mu\text{g}/\text{m}^3$ (annual average). This is well below the Acceptable Source Impact Level of 0.077 $\mu\text{g}/\text{m}^3$ (annual average).

Potential emissions of criteria air pollutants (nitrogen oxides, carbon monoxide, sulfur dioxide, particulate matter) and volatile organic compounds are all at or below 1 tons per year each. At the proposed emission rates and exhaust configurations, no adverse ambient air quality impact is anticipated.

Conclusions

- 9.a Installation of the new coffee roaster and thermal oxidizer, as proposed in ADP Application CL-1914, will not cause the ambient air quality requirements of Title 40 Code of Federal Regulations (CFR) Part 50 "National Primary and Secondary Ambient Air Quality Standards" to be violated.
- 9.b Operation of the new coffee roaster and thermal oxidizer as proposed in ADP Application CL-1914, will not cause the requirements of WAC 173-460 "Controls for New Sources of Toxic Air Pollutants," WAC 173-470 "Ambient Air Quality Standards for Particulate Matter," WAC 173-474 "Ambient Air Quality Standards for Sulfur Oxides," and WAC 173-475 "Ambient Air Quality Standards for Carbon Monoxide, Ozone, and Nitrogen Dioxide" to be violated.
- 9.c The new coffee roaster and thermal oxidizer proposed in ADP Application CL-1914 can be operated without causing a violation of emission standards for sources as established under SWCAA General Regulations Sections 400-040 "General Standards for Maximum Emissions," 400-050 "Emission Standards for Combustion and Incineration Units," and 400-060 "Emission Standards for General Process Units."

10. DISCUSSION OF APPROVAL CONDITIONS

SWCAA has made a determination to issue Air Discharge Permit 10-2934 in response to ADP Application CL-1914. Air Discharge Permit 10-2934 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below.

- 10.a General Basis. Approval conditions for equipment affected by this permitting action incorporate the operating schemes proposed by the permittee in the Air Discharge Permit application.
- 10.b Emission Limits. Annual emission limits for the coffee roaster and oxidizer system were established at the quantity of emissions anticipated from the operation of the unit for 8,760 hours per year at full rated capacity using the emission factors supplied in Section 6. As indicated in Section 8, these emission levels meet the requirements of BACT for this installation.
- 10.c Operating Limits and Requirements. The ADP requires that the thermal oxidizer be operated whenever the coffee beans are 270°F until at least 30 seconds after the beans are dropped into the cooling tray. This is the period of time during which the beans are likely to generate significant emissions (primarily odor and smoke).

To minimize the impact of odors and other emissions on ambient air, the thermal oxidizer exhaust is required to be exhausted vertically above the levels of the roof and at a point higher than adjacent buildings and/or terrain. This is good engineering practice and is required by SWCAA 400-200(1).

- 10.d Monitoring and Recordkeeping. Sufficient monitoring and recordkeeping was established to document compliance with the annual emission limits and provide for general requirements (e.g. upset reporting, annual emission inventory submission).
- 10.e Emission Monitoring and Testing Requirements. See Section 12.
- 10.f Reporting. Specific reporting deadlines were established for each reporting requirement. The submittal date refers to the earlier of the date the report is delivered to SWCAA or the postmarked date if sent through the US Post Office.

Upset conditions with the potential to cause excess emissions must be reported immediately in order to qualify for relief from penalty in accordance with SWCAA 400-107 for unavoidable exceedances. In addition, prompt reporting allows for prompt and accurate investigation into the cause of the event and the prevention of similar future incidents.

The permit requires reporting of the annual air emissions inventory, and reporting of the data necessary to develop the emission inventory (fuel consumption by the coffee roaster and catalytic oxidizer system and the total amount of coffee roasted).

11. START-UP AND SHUTDOWN/ALTERNATIVE OPERATING SCENARIOS/POLLUTION PREVENTION

- 11.a Start-up and Shutdown Provisions. Pursuant to SWCAA 400-081 "Start-up and Shutdown," technology based emission standards and control technology determinations shall take into consideration the physical and operational ability of a source to comply with the applicable standards during start-up or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during start-up or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during start-up or shutdown.

The permittee has not identified any start-up and shutdown periods during which affected equipment is not capable of achieving continuous compliance with applicable emission standards or approval conditions. To SWCAA's knowledge, this facility can comply with all applicable standards during startup and shutdown.

- 11.b Alternate Operating Scenarios. SWCAA conducted a review of alternate operating scenarios applicable to equipment affected by this permitting action. The permittee did not propose or identify any applicable alternate operating scenarios. Therefore, none were included in the approval conditions.
- 11.c Pollution Prevention Measures. SWCAA conducted a review of possible pollution prevention measures for the facility. No pollution prevention measures other than the control measures identified in the permit were identified by either the permittee or SWCAA. Therefore, none were included in the approval conditions.

12. EMISSION MONITORING AND TESTING

The thermal oxidizer system is very simple (no significantly degradable parts), and the potential emissions from the proposed equipment are relatively minor therefore no periodic emission monitoring or testing was required.

13. FACILITY HISTORY

This will be a new facility utilizing a thermal oxidizer previously in use at 11800 NE 95th Street #201, Vancouver, WA (Brewed Awakenings, SWCAA ID #2164).

14. PUBLIC INVOLVEMENT

- 14.a Public Notice for Air Discharge Permit Application CL-1914. Public notice for Air Discharge Permit Application CL-1914 was published on the SWCAA internet website from April 13, 2010 through May 14, 2010.
- 14.b Public/Applicant Comment for Air Discharge Permit Application CL-1914. SWCAA did not receive formal comments, a comment period request, or any other inquiry from the public or the applicant regarding this Air Discharge Permit application. Therefore no public comment period was provided for this permitting action.
- 14.c State Environmental Policy Act. A Determination of Nonsignificance (DNS) was issued for this permitting action by SWCAA on May 14, 2010.