SMAQMD BACT CLEARINGHOUSE

ACTIVE

CATEGORY Type: **Dryer/Oven used for nut processing**

BACT Category: Minor Source BACT

BACT Determination Number:	384	**BACT Determination Date:**	11/26/2024

Equipment Information

Permit Number: N/A - Generic BACT Determination

Equipment Description: Dryer oven used for nut processing

Unit Size/Rating/Capacity: < 5.0 MMBTU/hr, VOC <0.7 TPY, operating <392F

Equipment Location: N/A - Generic BACT Determination

BACT Determination Information

District Contact: Venk Reddy **Phone No.:** 2972071146 **Email:** vreddy@airquality.org

ROCs	**Standard:**	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
NOx	**Standard:**	25 ppmv @ 3% O2
	Technology Description:	Low NOx Burner
	Basis:	Achieved in Practice
SOx	**Standard:**	Natural Gas fuel or (0.05% by volume)
	Technology Description:	
	Basis:	Achieved in Practice
PM10	**Standard:**	Natural Gas or equivalent
	Technology Description:	
	Basis:	Achieved in Practice
PM2.5	**Standard:**	No Standard
	Technology Description:	
	Basis:	Achieved in Practice
CO	**Standard:**	75 ppmv @ 3% O2
	Technology Description:	

		Basis:	Achieved in Practice
	LEAD	**Standard:**	No standard
		Technology Description:	
		Basis:	Achieved in Practice

Comments:	This is a generic BACT determination based on BACT determinations made, and published, by other air agencies in California and/or other States.

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777 12th Street, Ste. 300

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NOS.: 384

DATE: 9/22/2024

ENGINEER: Venk Reddy

Category/General Equip Description: Dryer/oven used for nut processing (non roasting), Food grade <5.0 MMBTU/hr, VOC emissions < 0.7 TPY lbs/year and operating < 320F

Equipment Specific Description: Dryer/Oven, natural gas fired, food grade without yeast <5.0 MMBTU/hr total VOC let than 0.7 TPY and operating at less than 320F.

Equipment Size/Rating: Minor Source BACT

Previous BACT Det. No.: none

This BACT determination is for a dryer/oven used for processing nuts. As part of the process of preparing the nuts for market, additives and flavorings are added and then placed in the oven. During the process, VOCs in the flavorings are released as emissions. Other emissions involved are from natural gas combustion. This process will be compared to other comparable ovens used in food manufacturing that do not use yeast.

BACT/T-BACT ANALYSIS

A. ACHIEVED IN PRACTICE (Rule 202, §205.1a):

The following control technologies are currently employed as BACT/T-BACT for ovens used for food production by the following agencies and air pollution control districts:

US EPA

Projects entered in the EPA RACT/BACT LAER clearinghouse between the period of 1/1/2014 and 9/22/2024 were reviewed for this BACT determination. There were no projects involved with nuts or food.

RULE REQUIREMENTS:

There are no rules that govern nut processing or food production. There are rules that govern cellulose food casing and the production of baker's yeast used in bread production which will not be considered since yeast is not part of the nut preparation process.

California Air Resource Board (CARB)

BACT

Three projects were identified as similar operations. SJVUAPCD has several BACT guidelines that could be considered as applicable but have been rescinded or updated. They are listed at the end of this section.

BACT FOR FOOD OVEN, SNACK FOOD, Cheese Puffs, Application No. 499293/551284 (SCAQMD)	
Pollutant	**Standard**
VOC	No standard
NOx	25 ppmv @ 3% O2
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	75 ppmv @ 3% O2

BACT FOR FOOD OVEN, TORTILLA CHIP OVEN, Application No. 551284 (SCAQMD)	
Pollutant	**Standard**
VOC	No standard
NOx	54 ppmv @ 3% O2
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	2000 ppmv @ 3% O2

From SJVUAPCD

1.6.4 Snack Food Oven. (revised in 2023 to be discussed in the SJVUAPCD section)
1.6.7 Pistachio Roasting Operation (rescinded)
1.6.9 Dryer Almond Processing, < 10 MMBTU/hr (rescinded)
1.6.16 Dryer Seed Processing (rescinded)
1.6.23 Pistachio, Almond and Walnut Dryers (rescinded)

Source: ARB BACT Clearinghouse

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
There are no rule standards for this source category.

Sacramento Metropolitan AQMD

BACT

BACT FOR FOOD OVEN, TORTILLA OVEN, BACT 292	
Pollutant	**Standard**
VOC	No standard
NOx	30 ppmv @ 3% O2
SOx	Natural Gas Fuel or equivalent and 500 ppmvd @ 3% O_2 (0.05% by volume)
PM10	Natural gas fuel or equivalent
PM2.5	No standard
CO	400 ppmv @ 3% O2

T-BACT For Tortilla Ovens ≤ 500 °F		
Pollutant	**Standard**	**Source**
Organic HAP/VHAP (T-BACT)	T-BACT is equivalent to BACT for VOC	SMAQMD

SMAQMD BACT 292

RULE REQUIREMENTS:

Rule 419 – NOx from Miscellaneous Combustion Units (Adopted 7/26/2018)

This rule applies to any miscellaneous combustion unit or cooking unit with a total rated heat input capacity of 2 million Btu per hour or greater that is located at a major stationary source of NOx and to any miscellaneous combustion unit or cooking unit with a total rated heat input capacity of 5 million Btu per hour or greater that is not located at a major stationary source of NOx. The NOx and CO emission limits for cooking units are summarized in the following table.

COOKING UNITS EMISSION LIMITS EXPRESSED AS PPMV, corrected to 3% O_2 (A)		
Equipment Category	**NOx Limit ppmv, corrected to 3% O_2 (lb/MMBtu)**	**CO Limit ppmv, corrected to 3% O_2 (lb/MMBtu)**
	Process Temperature	800 (0.60)
	< 500 °F	
Cooking Unit	40 (0.049)	

(A) Limits from Table 2 of SMAQMD Rule 419

Rule 406 – Specific Contaminants (Amended 12/6/1978)

This rule limits the emission of sulfur compounds and combustion contaminants.

A person shall not discharge into the atmosphere from any single source of emission equipment whatsoever:
Sulfur compounds in any state or combination thereof exceeding in concentration at the point of discharge: sulfur compounds, calculated as sulfur dioxide: 0.2% volume.
Combustion contaminants in any state or combination thereof exceeding in concentration at the point of discharge: 0.23 grams per dry standard cubic meter (0.1 grains per dry standard cubic foot) of gas calculated to 12% carbon dioxide at standard conditions.

South Coast AQMD

BACT

Source: SCAQMD BACT Guidelines for Non-Major Polluting Facilities, page 59 (Last Revised 2/1/2019)

Food Oven	
VOC	No Standard
NOx	For Ribbon Burners ≤ 500°F 30 ppmvd @ 3% O_2 Other Direct Fired Burner 30 ppmvd @ 3% O_2 Infrared Burner 30 ppmvd @ 3% O_2
SOx	Natural gas
PM10	Natural gas
PM2.5	No standard
CO	Compliance with applicable SCAQMD Rules 407 or 1153.1

RULE REQUIREMENTS:

Reg IV, Rule 407 – Liquid and Gaseous Air contaminants (Last amended 4/2/1982)
A person shall not discharge into the atmosphere from any equipment:
1. Carbon Monoxide (CO) exceeding 2,000 ppm by volume measured on a dry basis, averaged over 15 consecutive minutes
2. Sulfur compounds which would exist as liquid or gas at standard conditions exceeding 500 ppm, calculated as sulfur dioxide (SO2) and averaged over 15 consecutive minutes

Reg IV, Rule 1147 – NOx Reductions from Miscellaneous Sources (Last amended 5/6/2022)
This rule is to reduce NOx emissions from gaseous and liquid fuel fired combustion equipment. Per section (m)(2), this rule does not apply to charbroilers or food ovens. Therefore, this rule is not applicable to this BACT Determination.

Reg XI, Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (Last amended 8/4/2023)
This rule applies to ovens, dryers, smokers, and dry roaster with NOx emissions from fuel combustion and are used to prepare food or products for making beverages for human consumption. For nut preparation, and units that will be subject to this BACT, the ovens are used to remove water or moisture to dry food products.

Any person owning or operating a drying oven subject to this rule shall not operate the unit in a manner that exceeds NOx 30 ppm and CO emissions of 800 ppm by volume at 3% O_2.

NOX AND CO EMISSION LIMITS AT 3% O2 PER RULE 1153.1		
	NOx	CO
Drying Oven	30	800

San Joaquin Valley APCD

BACT
Source: SJVAPCD Guidelines

BACT FOR FOOD OVEN, Snack Chip Oven, BACT 1.6.4 (6/21/23)	
Pollutant	**Standard**
VOC	Use of Natural Gas
NOx	30 ppmv @ 3% O2 (0.036 lb/MMBTU) with use of low NOx burner.
SOx	Use of Natural Gas
PM10	Natural gas fuel
PM2.5	No standard
CO	400 ppmv @ 3% O2

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

Rule 4309 – Dryers, Dehydrators, and Ovens (12/15/05)
This rule applies to any dryer, dehydrator, or oven that has a total rated heat input of ≥ 5.0 MMbtu/hr. Per Section 4.1.4 the requirements of this rule shall not apply to units used to bake or fry food for human consumption. Therefore, this rule does not apply.

Rule 4801 – Sulfur Compounds (Amended 12/17/1992)
A person shall not discharge into the atmosphere sulfur compounds, which would exist as a liquid or gas at standard conditions, exceeding in the concentration at the point of discharge: two-tenths (0.2) percent by volume calculated as sulfur dioxide, on a dry basis averaged over 15 consecutive minutes.

San Diego County APCD

BACT
Source: NSR Requirements for BACT (November 2023)
There are no BACT determinations for ovens used for food.

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
Regulation 4, Rule 68 – Fuel-Burning Equipment – Oxides of Nitrogen (9/20/1994)
This rule does not apply to fuel burning equipment which has a maximum input rating of < 50 mmBTU/hr.

Emissions of nitrogen oxides, from any non-vehicular fuel burning equipment subject to this rule, calculated as nitrogen dioxide at three percent oxygen on a dry basis, shall not exceed the following levels:

Type of Fuel	Nitrogen Oxides, Concentration	
	Volume (ppm)	Mass (mg/m3, at 20°C)
Gaseous	125	240
Liquid or Solid	225	430

When more than one type of fuel is used, the allowable NOx concentration shall be determined by proportioning the gross heat input for each fuel to its respective allowable concentration.

Regulation 4, Rule 53 – Specific Air Contaminants – (1/22/1997)
A person shall not discharge into the atmosphere from any single source of emission equipment whatsoever:
1. Sulfur compounds calculated as sulfur dioxide: 0.05 percent, by volume, on a dry basis.
2. Combustion particulates: 0.1 grains per dry standard cubic foot of gas which is standardized to 12% of carbon dioxide by volume.

Bay Area AQMD

BACT
Source: BAAQMD BACT Guidelines
There are no BACT standards published in the clearinghouse for this category.

T-BACT
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
Reg 8, Rule 2 – Organic Compounds from Miscellaneous Operations (5-4-22)
Preparation of Food: Emissions from the preparation of food for human consumption provided best modern practices are used, are exempt from this Rule.

Reg 9, Rule 3 – Inorganic Gaseous Pollutants; NOx from Heat Transfer Operations §9-3-301(3-17-1982)
This rule does not apply to any new or modified heat transfer operation designed for a maximum heat input of less than 264 GJ (250 million BTU) per hour.

Summary of Achieved in Practice Control Technologies

The following control technologies have been identified and are ranked based on stringency:

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
Pollutant	**Standard**
VOC	1. No Standard [USEPA, CARB, SMAQMD, SCAQMD, BAAQMD, SJVAPCD, SDAPCD]
NOx	1. 25 ppmv @3% O2 [CARB] 2. 30 ppmv @ 3% O2 [SMAQMD, SCAQMD, SJVAPCD] 3. 125 ppm [SDCAPCD] 4. No standard [BAAQMD]
SOx	1. Natural gas fuel or equivalent and 500 ppmvd @ 3% O_2 (0.05% by volume) [SMAQMD, SCAQMD] 2. No standard [USEPA, CARB, BAAQMD]
PM10	1. Natural gas fuel or equivalent [SMAQMD, SCAQMD] 2. No standard [USEPA, CARB, BAAQMD]
PM2.5	1. No Standard [USEPA, CARB, SMAQMD, SCAQMD, BAAQMD, SJVAPCD, SDAPCD]
CO	1. 75 ppmv @ 3% O2 [CARB] 2. 400 ppmv @3% O2 [SMAQMD, SJVAPCD] 3. No standard [SCAQMD, USEPA, BAAQMD, SDAPCD]
T-BACT	1. T-BACT is equivalent to BACT for VOC [SMAQMD] 2. No standard [SCAQMD, CARB, USEPA, BAAQMD, SJVAPCD, SDAPCD]

Summary Table

The following control technologies have been identified as the most stringent, achieved in practice control technologies:

BEST CONTROL TECHNOLOGIES ACHIEVED IN PRACTICE		
Pollutant	**Standard**	**Source**
VOC	No standard	All
NOx	25 ppmv @ 3% O2	CARB
SOx	Natural gas fuel or equivalent and 500 ppmvd @ 3% O_2 (0.05% by volume)	SMAQMD, SCAQMD

BEST CONTROL TECHNOLOGIES ACHIEVED IN PRACTICE		
PM10	Natural gas fuel or equivalent	SMAQMD, SCAQMD
PM2.5	No standard	All
CO	75 ppmv @ 3% O2	CARB
T-BACT	T-BACT is equivalent to BACT for VOC	SMAQMD

B. TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.):

Technologically Feasible Alternatives:

Any alternative basic equipment, fuel, process, emission control device or technique, singly or in combination, determined to be technologically feasible by the Air Pollution Control Officer.

The table below shows the technologically feasible alternatives identified as capable of reducing emissions beyond the levels determined to be "Achieved in Practice" as per Rule 202, §205.1.a.

A carbon bed is not considered for the control of VOCs because the exhaust temperature is too hot for this technology. Exhaust temperatures are 270F for this process. An SCR was not considered for NOx control since the minimum temperature to operate an SCR with a low temperature catalyst is 160C to 300C or 320F to 572F (ref. *Low Temperature SCR Catalyst Development and Industrial applications in China, published March 17, 2022)*. Ovens/dryers used for nut processing operate at temperatures lower than 320F would not be able to use an SCR. This BACT will be restricted to only be applicable to ovens/dryers that operate below 320F.

Pollutant	Technologically Feasible Alternatives
VOC	Thermal Oxidizer
NOx	No other technologically feasible option identified
SOx	No other technologically feasible option identified
PM10	No other technologically feasible option identified
PM2.5	No other technologically feasible option identified
CO	No other technologically feasible option identified

Cost Effective Determination:

After identifying the technologically feasible control options, a cost analysis is performed to take into consideration economic impacts for all technologically feasible controls identified.

Per the SMAQMD BACT policy the interest rate is calculated by using the 6-month average 20-year treasury rate. The 20-year treasury rate was used since the life of the equipment is expected to be 20 years.

9-1-24 4.13%
8-1-24 4.21%
7-1-24 4.56%
6-1-24 4.54%
5-1-24 4.71%
4-1-24 4.77%

The average is 4.49% adding two interest point and round up gives an interest rate to be used in this assessment of 7%.

VOC:
The lowest cost oxidizer, the recuperative oxidizer, was chosen to do the cost analysis. The source of VOCs comes from the natural gas combustion and the flavorings that are added to the nuts. The dryer heats up the nuts and evaporates the VOCs from the added flavorings. To determine the size of the thermal oxidizer needed for this process, a VOC PPM value of 1417 was used as an estimate of the VOCs from the flavorings. This value is based on the amount of flavoring that will be added to the nuts.

An expected VOC loading of 1417 ppm was used in order to size the equipment. As a worst case analysis, an operating time of only 1 hour per year was chosen to minimize the equipment and operational costs. With this assumption, the VOC limit was established such that the resultant cost effectiveness value was just above the District's published cost effectiveness thresholds. Therefore any increased equipment or operational cost or any reductions in the amount of VOC reduced would only increase the calculated cost effectiveness making it more not cost effective.

At an operation time of 1 hour a year and a controlled VOC amount of 0.7 tons/year with a loading of the thermal oxidizer of 1417 PPM, the cost effectiveness value is $26,927. Since this is higher than the $26,300 cost effective threshold for VOCs, effective July 1, 2024, it has been determined to be not cost effective. See Attachment A for more details.

C. SELECTION OF BACT:

Based on the above analysis, BACT for VOC, NOx, SOx, PM10, and CO will remain at what is currently achieved in practice and BACT for PM2.5 will be set to be the same as for PM10.

BACT FOR OVEN USED FOR NUT PROCESSING OPERATING <5 MMBTU/HR, < 320F AND <0.7 TPY OF VOC		
Pollutant	**Standard**	**Source**
VOC	No standard	All
NOx	25 ppmv @ 3% O2	CARB

BACT FOR OVEN USED FOR NUT PROCESSING OPERATING <5 MMBTU/HR, < 320F AND <0.7 TPY OF VOC		
SOx	Natural gas fuel or equivalent and 500 ppmvd @ 3% O_2 (0.05% by volume)	SMAQMD, SCAQMD
PM10	Natural gas fuel or equivalent	SMAQMD, SCAQMD
PM2.5	No standard	All
CO	75 ppmv @ 3% O2	CARB

T-BACT FOR OVEN USED FOR NUT PROCESSING OPERATING <5 MMBTU/HR, <320F AND <0.7 TPY OF VOC		
Pollutant	**Standard**	**Source**
VOC	Equivalent to VOC standard	SMAQMD

(A) Since the current BACT standards are more health protective than previously published T-BACT standards, T-BACT standards will be updated to follow the BACT standards.

APPROVED BY: Steve Mesrobian **DATE:** 11/26/24

Appendix A

Cost Effectiveness Analysis for a Thermal Oxidizer