

**San Joaquin Valley
Unified Air Pollution Control District
Best Available Control Technology (BACT) Guideline 1.6.4***

Emissions Unit: Snack Chip Oven

Industry Type: Food Manufacturing

Equipment Rating: All

Last Update: June 21, 2023

Pollutant	Achieved-in-Practice or contained in SIP	Technologically Feasible	Alternate Basic Equipment
NO _x	30 ppmvd @ 3% O ₂ (0.036 lb/MMBtu) with use of low-NO _x burner system and using natural gas as primary fuel, or equivalent controls	Low temperature selective catalytic reduction (SCR) to achieve 2.5 ppmvd NO _x @ 3% O ₂ (0.003 lb/MMBtu) and use of PUC quality natural gas fuel, or equivalent controls	
SO _x	Use of PUC quality natural gas		
PM ₁₀	Use of PUC quality natural gas		
CO	400 ppmvd @ 3% O ₂ and use of PUC quality natural gas		
VOC	Use of PUC quality natural gas		

*BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

***This is a Summary Page for this Class of Source - Permit Specific BACT Determinations on Next Page(s)**

Best Available Control Technology Analysis

Snack Chip Ovens

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I. Introduction

The objective of this project is to review and update the existing Best Available Control Technology (BACT) guideline 1.6.4 for natural gas-fired tortilla chip ovens used at commercial snack manufacturing facilities (refer to **Appendix B**).

II. BACT Categories

BACT guideline, which is the focus of this project, is:

- BACT guideline 1.6.4 – Tortilla Chip Ovens

While the existing guideline is applicable to any tortilla chip oven at a commercial snack chip manufacturing facility, it is applicable to any oven that produces corn chips or other similar snack chip products. These ovens cook the snack chip using radiant heat and generate NO_x, SO_x, PM₁₀, CO and VOC emissions from combustion of natural gas.

III. Top-Down BACT Analysis

A. BACT analysis for NO_x Emissions

NO_x emissions will generate from combustion of natural gas in oven burner(s).

Step 1 - Identify All Possible Control Technologies

BACT Clearinghouse Survey:

The following BACT clearinghouses were consulted to determine whether any tortilla chip oven at commercial snack making operation have been required to employ emission controls to reduce NO_x emissions:

- EPA RACT/BACT/LAER clearinghouse
- CARB BACT clearinghouse
- South Coast AQMD BACT clearinghouse
- Bay Area AQMD BACT clearinghouse
- Sacramento Metro AQMD BACT clearinghouse
- San Joaquin Valley APCD BACT clearinghouse

EPA RACT/BACT/LAER clearinghouse

The database was searched using the following criteria:

Permit Date: 1/1/2013 to 2/28/2023

Process Type: All Process Types

Process Name Contains: Tortilla oven, Food oven
Pollutant Name: All pollutants

No relevant results were found.

CARB BACT clearinghouse

The database (<https://ww2.arb.ca.gov/our-work/programs/technology-clearinghouse/clearinghouse-tools/bact-guidelines-tool>) was searched using the following criteria:

Search: oven

BACT Guideline List Data Last Updated 3/18/2022

Agency: (All) Date Filter: 6/27/1991 - 2/3/2022

Emitting Unit: (All) Emitting Unit Detail: (All)

Emitting Process: (All)

Search (Title, Agency, ID, Emitting Unit type and keywords, Emitting Process type and keywords): oven

Agency	District ID	Date	Title	
Bay Area	47.1.1	3/3/1992	Coffee Roaster - Coffee Roasting < 110,000 Btu/hr	●
	111A.1	9/13/1991	Miscellaneous Operations - Meat Broiler and Barbecue Oven	●
	161.4.3	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Topcoat and/or Primer)	●
	161.4.4	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Sealer and/or Elpo)	●
San Joaquin	1.5.5	10/19/2000	Glass Bottle Label Curing Lehr - < 10 MMBtu/hr, Natural Gas Fired	●
	1.5.6	10/15/2014	Metal Heat Treatment Oven	●
	1.6.1	4/14/2020	Vegetable Dry Roasting Operation	●
	1.6.4	6/16/1999	Oven - Snack Food	●
	1.6.7	1/27/1994	Pistachio Roasting Operation	●
	1.6.10	7/30/1998	Oven - Wheat Drying, < or = 10 MMBtu/hour	●
	1.6.24	12/30/2020	Commercial Bakery Oven	●
	1.6.28	7/2/2012	Direct-Fired Conveyorized Hotdog Cooking Oven	●
	1.6.29	7/12/2012	Indirect-fired Impingement Meatball Cooking Oven	●
	1.7.1	4/3/2000	Oven - Polyethylene Curing, = or < 20 MMBtu/hr	●
	1.7.2	8/19/1996	Oven - Plastisol curing/fusing, = or < 2.5 MMBtu/hr	●
	1.7.3	8/13/1999	Oven - Parts Cleaning, Burnoff or Burnout	●
	4.2.10	9/19/2019	Motor Vehicle Chassis Coating Operation - Electrodeposition with Curing Oven	●
	4.3.7	5/1/2020	Powder Coating Operation with Curing Oven	●
	4.7.1	6/25/1999	Offset Lithographic Printing - Publication Printing, High-end Graphics, Heatset using with a Drying	●
	4.8.7	1/25/1999	Fiberglass Products Manufacturing - Fiberglass Mat Dryer and Curing Oven	●
	4.12.3	8/28/2019	Chemical Evaporator / Dryer / Oven	●
5.6.3	6/2/2002	Animal Feed Supplements - Steam-Heated Molasses Cooker	●	
South Coast	n/a	2/2/2018	Dryer Or Oven, Carpet Oven, Rotary Dryer, Spray Dryer, Flash Dryer, Tray, Agitated Pan, Vacuum D Food Oven, Ribbon Burner, Direct Fired Burner, Infrared Burner, Add-On Control, Bakery Oven, Yei	●

This database identifies relevant BACT guidelines in South Coast AQMD and San Joaquin Valley APCD. These guidelines will be reviewed and discussed under each air District’s BACT clearinghouse section below.

South Coast AQMD BACT clearinghouse

The existing determinations under “Part B: Section I – SCAQMD LAER/BACT” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/i---scaqmd-laer-bact>). This section has one relevant BACT guideline for a tortilla chip oven, which is summarized below:

A 5.774 MMBtu/hr tortilla chip oven was installed at Frito-Lay, Inc., at 9535 Archibald Ave in Rancho Cucamonga CA 91730 under App # 551284. The oven startup date was March 17, 2014. This oven is used to dry and bake tortilla chips. The oven is equipped with infra-red burners to dry masa and ribbon burners to bake masa into tortilla chips prior to cooking dried chips in a deep fat oil fryer. This oven was source tested on January 13, 2015; NOx results were 43 ppmvd NOx @ 3% O₂, and 36 ppmv CO at stack conditions. The oven average temperature was 357°F during the test. The guideline mentions that source test prior to the January 13, 2015 test measured NOx at 53.7 ppmv @ 3% O₂. The BACT guideline established for this unit set NOx standard at 54 ppmvd NOx @ 3% O₂, averaged over 1 hour. For reference the BACT guideline is available at: http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/2-2-18_laer_fritolay_tort_chip_oven.pdf?sfvrsn=12. The BACT guideline also cites that an identical unit D-86 at this site was also tested; the test results were 22.9 ppmvd NOx @ 3% O₂ and 85 ppmv CO at stack conditions.

The existing determinations under “Part B: Section II – Other LAER/BACT” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/ii---other-laer-bact>). No relevant BACT determination was found.

The existing determinations under “Part B: Section III – Other Technologies” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/iii---other-technologies>). No relevant BACT determination was found.

The draft LAER Part B, Section I and III Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_partb_draft_2-2-18.pdf?sfvrsn=6).

The draft document includes two BACT guidelines:

- 1.) the BACT guideline (prepared for App # 551284) is discussed above, and
- 2.) the BACT guideline for another 1.6 MMBtu/hr snack food oven under App # 499293/551284 was identified. This requirements in the guidelines are discussed below:

The BACT guideline covers (item 2 above) a 1.6 MMBtu/hr natural gas fired food oven used, which is used to bake corn meal cheese puffs. The oven start-up date was April 15, 2008. The oven is equipped with Maxon’s Cyclomax burner system.

This oven was tested for NOx and CO emissions on April 29, 2009. The results were 20 ppmv NOx @ 3% O₂ (0.024 lb-NOx/MMBtu) and 58 ppmv CO @ 3% O₂ (0.043 lb-CO/MMBtu). The oven was operating at 298°F during the test. This oven's NOx and CO emissions are less than the tortilla chip oven as this oven was operated at lower temperature, and is equipped with Maxon's cyclomax burners (cabinet burners) typically located outside the oven as opposed to infrared or ribbon style burners inside the oven typically used in tortilla chip ovens. SCAQMD considered the results of this oven in establishing BACT standard of 30 ppmvd @ 3% O₂ (0.036 lb-NOx/MMBtu) in 2018 (see below).

Further, the draft Major Source, Part D Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_guidelines_partd_draft_2-2-18.pdf?sfvrsn=6). There is a relevant draft BACT for ovens. The final version of this guideline is as follows (<http://www.aqmd.gov/docs/default-source/bact/bact-guidelines/bact-guidelines-2022/part-d---bact-guidelines-for-non-major-polluting-facilities.pdf?sfvrsn=8>):

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

2-2-2018 Rev. 0

Equipment or Process: **Food Oven**

Subcategory ¹	Rating/Size	Criteria Pollutants					Inorganic
		VOC	NOx	SOx	CO	PM10	
Ribbon Burner	> 500°F		60 ppmvd @ 3% O ₂ (2-2-2018)	Natural Gas (2-2-2018)	Compliance with applicable Rules 407 or 1153.1 (2-2-2018)	Natural Gas (2-2-2018)	
	≤ 500°F		30 ppmvd @ 3% O ₂ (2-2-2018)	Same as above	Same as above	Same as above	
Other Direct Fired Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Infrared Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Add-on Control for Bakery Oven processing yeast leavened products with emissions ≥ 30 lb VOC/day		Catalytic oxidizer with 95% overall control efficiency (mass basis); catalyst inlet temperature ≥ 600°F; ceramic prefilter (2-2-2018)	Compliance with Rule 1147 at the time of applicability (2-2-2018)				

¹Indirect Fired units may be subject to Rules 1146 and 1146.1 and BACT for Process Heater.

Bay Area AQMD BACT clearinghouse

The BACT guidelines available on BAAQMD website were reviewed (<http://www.baaqmd.gov/permits/permitting-manuals/bact-tbact-workbook>).

No relevant BACT guideline was found.

Sacramento Metro AQMD BACT Clearinghouse

The BACT guidelines available on the AQMD website were reviewed ([http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-\(bact\)](http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-(bact))). The following BACT guideline was found:

SMAQMD BACT CLEARINGHOUSE

ACTIVE

CATEGORY Type: OVEN		
BACT Category: Small Emitter BACT (PTE < 10 lb/day)		
BACT Determination Number: 292	BACT Determination Date: 8/17/2021	
Equipment Information		
Permit Number: 26924		
Equipment Description: TORTILLA OVEN		
Unit Size/Rating/Capacity: Tortilla Oven ≤ 500 Deg. F		
Equipment Location: BERBER FOOD MANUFACTURING DBA MI RANCHO 10115 IRON ROCK WAY ELK GROVE, CA		
BACT Determination Information		
District Contact: Felix Trujillo Phone No.: (916) 874 - 7357 email: ftrujillo@airquality.org		
ROCs	Standard:	
	Technology Description:	
	Basis:	
NOx	Standard:	30 ppmvd @ 3% O2
	Technology Description:	Low NOx Burner
	Basis:	Achieved In Practice
SOx	Standard:	500 ppmvd @ 3% O2
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved In Practice
PM10	Standard:	Natural gas fuel or equivalent
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved In Practice
PM2.5	Standard:	
	Technology Description:	
	Basis:	
CO	Standard:	400 ppmvd @ 3% O2
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved In Practice
LEAD	Standard:	
	Technology Description:	
	Basis:	
Comments: T-BACT is equivalent to BACT for VOC.		

The guideline is available at:
<https://www.airquality.org/StationarySources/Documents/Tortilla%20Oven%20500%20F%20BACT%20292.pdf>

Note that this BACT guideline is for a direct-fired Tortilla Oven, and not the Tortilla Chip Oven. However, due to operational similarities, the emission standard and technologies appears to be transferrable to Tortilla Chip Ovens.

SJVAPCD BACT clearinghouse

The current requirements in District BACT guideline 1.6.4 for snack ovens are summarized in the following table:

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
NOx	Use of natural gas fuel		

Evaluation of an SCR system – Technologically Feasible Option

NOx can be reduced with the use of an add-on emission control device such as selective catalytic reduction (SCR) system. An SCR system utilizes injection of anhydrous ammonia, aqueous ammonia, or urea solution into the exhaust gas to reduce NOx emissions. SCR uses a catalyst consisting of base metals (such as vanadium, molybdenum, or tungsten) to promote chemical reactions that reduce NOx emissions into N2 and water.

Use of SCR system is uncommon for tortilla chip ovens. Tortilla chip ovens do not consistently exhaust within the required temperature range of a typical SCR system (450°F to 800°F). However, use of low-temperature SCR system is considered technologically feasible, as is done for a bakery oven (refer to SJVAPCD District BACT clearinghouse BACT guideline 1.6.24). Therefore, via technology transfer, it is assumed that use of low-temperature SCR system are feasible for the tortilla chip ovens.

Survey of Federal, State and Local Rules and Regulations

The following rules and regulations were consulted to determine whether any limits apply to tortilla chip ovens at commercial snack making operation to reduce NOx emissions:

- New Source Performance Standard
- CARB (no applicable rules)
- South Coast AQMD Regulation XI Rules
- Bay Area AQMD Rules
- Sacramento Metro AQMD Rules
- San Joaquin Valley APCD Regulation IV Rules

Title 40, Chapter I, Subchapter C, Part 60 – Standards of Performance for New Stationary Sources

There is no subpart that is applicable to snack chip production facilities.

Therefore, no further discussion is required. Subparts are available at:

<https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-60?toc=1>

CARB (no applicable rules)

CARB's website includes rules from local air district related to stationary sources.

South Coast AQMD Regulation XI Rules

Rules in Regulation VII (<http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/regulation-xi>) are reviewed.

Rule 1147 – NO_x Reductions from Miscellaneous Sources (Last amended 7/7/2017)

The purpose of this rule is to reduce NO_x emissions from gaseous and liquid fuel fired combustion equipment.

Per section (g)(2), this rule does not apply to charbroilers or food ovens. Therefore, this rule is not applicable to this BACT Determination.

Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (Last amended 11/7/2014)

The purpose of this rule is to reduce NO_x emissions from gaseous and liquid fuel-fired combustion equipment.

This rule applies to in-use ovens, dryers, smokers, and dry roaster with NO_x emissions from fuel combustion and are used to prepare food or products for making beverages for human consumption. This rule is not applicable to new units.

Any person owning or operating an in-use unit (in operation prior to Nov 7, 2014) subject to this rule shall not operate the unit in a manner that exceeds 40 ppmv NO_x @ 3% O₂ for units with process temperature ≤500°F, and 60 ppmv NO_x @ 3% O₂ for units with process temperature >500°F. CO emissions shall not exceed 800 ppmv @ 3% O₂.

Bay Area AQMD Rules

BAAQMD rules (<https://www.baaqmd.gov/rules-and-compliance/current-rules>) were reviewed.

Regulation 6 Rule 2 – Commercial Cooking Equipment (12/5/07) was reviewed (<https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-6-rule-2-commercial-cooking-equipment/documents/rg0602.pdf?la=en&rev=42fc0966398c43f9b585572708a5ea70>). No requirements were found for tortilla chip ovens.

Sacramento Metro AQMD Rules

The AQMD regulation 4 was reviewed (<https://www.airquality.org/Businesses/Rules-Regulations>).

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

The purpose of this rule is to reduce NO_x and CO emissions from gaseous and liquid fuel fired miscellaneous combustion units and cooking units.

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 NO_x 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 NO_x.

Per section 302, Table 2, cooking units, NO_x shall not exceed 40 ppmv @ 3% O₂ for units operating at less than 500°F process temperature and 60 ppmv @ 3% O₂ for units operating at equal to or greater than 500°F. CO shall not exceed 800 ppm @ 3% O₂ for any unit.

San Joaquin Valley APCD Regulation IV Rules

Regulation IV (<https://www.valleyair.org/rules/1ruleslist.htm#reg4>) was reviewed.

Rule 4309 - Dryers, Dehydrators, and Ovens (12/15/05)

The purpose of this rule is to limit emissions of NO_x and CO from dryers, dehydrators and ovens.

This rule applies to any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel or is fired on gaseous and liquid fuel sequentially, and the total heat input for the unit is 5.0 MMBtu/hr or greater.

Per section 4.1.4, the requirements of this rule are not applicable to units used to bake or fry food for human consumption.

Since the proposed oven is used to bake tortilla chip for human consumption, this unit is not subject to the requirements of this rule.

Survey of Source Tests For Snack Chip Ovens at Food Manufacturing Operations in the SJVAPCD:

Permits records were queried to identify snack chip ovens with active permits at snack chip manufacturing operations. Several units were identified (see **Appendix C** for a complete list). Results from latest source test report available in permits database were noted for the tested units.

Facility Name	Permit #	Equipment Description	Source test data/other relevant information
FRITO-LAY INC	S-2076-4-9	TORTILLA CHIP LINE #1 WITH CONVEYORIZED OIL FRYER, HEAT EXCHANGER, SEASONER, 6.83 MMBTU/HR NATURAL GAS FIRED CASA HERRERA OVEN, AND ONE AMBIENT AIR COOLER SERVED BY HIGH VELOCITY DUCT FILTER AND HEAT RECOVERY AND HOT WATER STORAGE SYSTEM SHARED WITH S-2076-5	<p><u>Permitted Rate</u> 0.1 lb-NOx/MMBtu</p> <p><u>Source Test (12/22/21)</u> 0.0906 lb-NOx/MMBtu</p>
FRITO-LAY INC	S-2076-5-9	TORTILLA CHIP LINE #2 WITH CONVEYORIZED OIL FRYER, HEAT EXCHANGER, SEASONER, 6.83 MMBTU/HR NATURAL GAS FIRED CASA HERRERA OVEN, AND ONE AMBIENT AIR COOLER SERVED BY HIGH VELOCITY DUCT FILTER AND HEAT RECOVERY AND HOT WATER STORAGE SYSTEM SHARED WITH S-2076-4	<p><u>Permitted Rate</u> 0.1 lb-NOx/MMBtu</p> <p><u>Source Test (9/30/20)</u> 0.095 lb-NOx/MMBtu</p>
FRITO-LAY INC	S-2076-17-8	BAKED LINE #1 INCLUDING A 9.76 MMBTU/HR NATURAL GAS -FIRED BAKING OVEN, 10 MMBTU/HR NATURAL GAS-FIRED PRIMARY DRYER, STEAM HEATED FRYER WITH OIL MIST ELIMINATOR AND AMBIENT AIR COOLER	<p><u>Permitted Rate</u> 0.97 lb-NOx/hr (oven)</p> <p><u>Source Test (6/5/20)</u> 32.9 ppmvd NOx @ 3% O₂</p>
FRITO-LAY INC	S-2076-21-16	9.56 MMBTU/HR TORTILLA CHIP LINE #3, INCLUDING: 9.56 MMBTU/HR OVEN, FRYER, SEASONER, AIR COOLER, AND ON MACHINE SEASONING (OMS) SYSTEM SERVED BY DUST COLLECTOR	<p><u>Permitted Rate</u> 0.058 lb-NOx/MMBtu (oven)</p> <p><u>Source Test (12/20/19)</u> 0.058 lb-NOx/MMBtu (49.05 ppmvd NOx @ 3% O₂)</p>

The following conclusions are drawn from the above table:

- Lowest NOx emission rate was 32.9 ppmv NOx @ 3% O₂ for a 9.76 MMBtu/hr natural gas-fired baking oven (S-2076-17-8) during a source test on 6/5/2020.
- All units are fired on natural gas fuel.

List of Control Options:

Based on the search of *BACT Clearinghouse Survey, Survey of Federal, State and Local Rules and Regulations and Survey of Source Tests For Snack Chip Ovens at Food Manufacturing Operations in the SJVAPCD*, discussed above, the following emission control options were developed:

Type of burner	Process Temperature	Achieved-in-Practice NOx Standard	Technologically Feasible NOx Standard
Ribbon Burner	>500°F	60 ppmvd @ 3% O ₂ (Source: SCAQMD)	Use of low temperature SCR system Source: Technology transferred from SJVAPCD BACT guideline 1.6.24
	≤500°F	30 ppmvd @ 3% O ₂ (Source: SCAQMD, SMAQMD)	
Direct-fired/Infra-red burner		30 ppmvd @ 3% O ₂ (Source: SCAQMD, SMAQMD)	

Step 2 - Eliminate Technologically Infeasible Options

There are no technologically infeasible options. As such, no further discussion is required.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

1. Use of low-temperature SCR System – Technologically Feasible
2. Ribbon Burner: 60 ppmvd @ 3% O₂, use of natural gas, operating at process temperature of greater than 500°F - AIP

Ribbon Burner: 30 ppmvd @ 3% O₂, use of natural gas, operating at process temperature of less than or equal to 500°F - AIP

Direct-fired/Infrared burner: 30 ppmvd @ 3% O₂, use of natural gas - AIP

Step 4 - Cost Effectiveness Analysis

Option 1: Use of low temperature SCR System

Per R.F. MacDonald Company & Nationwide Boiler, base cost of an SCR system would be about \$315,000 (average July 2020 \$ value). Using inflation calculator (https://www.bls.gov/data/inflation_calculator.htm), the Dec 2022 \$ value of an SCR system would be \$360,829. Per guidance in District’s BACT policy, using 10 years with 4% interest rate, the annualized cost would be:

$$A = (\$360,829) \left[\frac{(0.04)(1+0.04)^{10}}{(1+0.04)^{10}-1} \right] = \frac{\$44,487}{yr}$$

In determining the cost of reduction, typically the District uses the emission reduction that can be achieved from the current “industry standard”. Use of low-NOx burner that can achieve 30 ppmvd @ 3% O₂ (0.036 lb/MMBtu) is assumed to be the “industry standard”. SCR is presumed to achieve 2.5 ppmvd NOx @ 3% O₂ (0.003 lb/MMBtu). Therefore, the reduction from the “industry standard” would be 2,457 lb-NOx/yr [(0.036-0.003 lb/MMBtu)(8.5 MMBtu/hr)(8,760 hr/yr)]. The cost of reduction (\$/ton) would be:

$$= \frac{\left(\frac{\$44,487}{yr}\right)\left(2,000\frac{lb}{ton}\right)}{\left(2,457\frac{lb-NOx}{yr}\right)} = \frac{\$36,212}{ton}$$

This project was deemed complete on February 27, 2023. Since the cost of NO_x reductions is greater than the threshold limit of \$32,900/ton in place on the date this project was deemed complete; therefore, it is not cost effective to require this control at this time. Note that actual cost of NO_x reduction will be much higher than the \$36,212/ton if annual operating and maintenance costs are included in the analysis.

Option 2:

- Ribbon Burner: 60 ppmvd @ 3% O₂, use of natural gas, operating at process temperature of greater than 500°F
- Ribbon Burner: 60 ppmvd @ 3% O₂, use of natural gas, operating at process temperature of less than or equal to 500°F
- Direct-fired/Infrared burner: 30 ppmvd @ 3% O₂, use of natural gas fuel

Since this option includes achieved-in-practice BACT standard, cost effectiveness analysis is not required.

Step 5 - Select BACT

The BACT for the proposed oven is to achieve 30 ppmv NOx @ 3% O₂. The applicant has proposed to achieve this standard. Thus, BACT requirements are satisfied.

B. BACT analysis for SOx Emissions

SOx emissions will generate from combustion of gaseous fuel in burners of snack chip ovens.

Step 1 - Identify All Possible Control Technologies

BACT Clearinghouse Survey:

The following BACT clearinghouses were consulted to determine whether any tortilla chip oven at commercial snack making operation have been required to employ emission controls to reduce SOx emissions:

- EPA RACT/BACT/LAER clearinghouse
- CARB BACT clearinghouse
- South Coast AQMD BACT clearinghouse
- Bay Area AQMD BACT clearinghouse
- Sacramento Metro AQMD BACT clearinghouse
- San Joaquin Valley APCD BACT clearinghouse

EPA RACT/BACT/LAER clearinghouse

The database was searched using the following criteria:

Permit Date: 1/1/2013 to 2/28/2023

Process Type: All Process Types

Process Name Contains: Tortilla oven, Food oven

Pollutant Name: All pollutants

No relevant results were found.

CARB BACT clearinghouse

The database (<https://ww2.arb.ca.gov/our-work/programs/technology-clearinghouse/clearinghouse-tools/bact-guidelines-tool>) was searched using the following criteria:

Search: oven

BACT Guideline List Data Last Updated 3/18/2022

Agency: (All) Date Filter: 8/27/1991 to 2/3/2022

Emitting Unit: (All) Emitting Unit Detail: (All)

Emitting Process: (All)

Search (Title, Agency, ID, Emitting Unit type and keywords, Emitting Process type and keywords): oven

Agency	District ID	Date	Title	
Bay Area	47.1.1	3/3/1992	Coffee Roaster - Coffee Roasting < 110,000 Btu/hr	●
	111A.1	9/13/1991	Miscellaneous Operations - Meat Broiler and Barbecue Oven	●
	161.4.3	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Topcoat and/or Primer)	●
	161.4.4	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Sealer and/or Elpo)	●
San Joaquin	1.5.5	10/19/2000	Glass Bottle Label Curing Lehr - < 10 MMBtu/hr, Natural Gas Fired	●
	1.5.6	10/15/2014	Metal Heat Treatment Oven	●
	1.6.1	4/14/2020	Vegetable Dry Roasting Operation	●
	1.6.4	6/16/1999	Oven - Snack Food	●
	1.6.7	1/27/1994	Pistachio Roasting Operation	●
	1.6.10	7/30/1998	Oven - Wheat Drying, < or = 10 MMBtu/hour	●
	1.6.24	12/30/2020	Commercial Bakery Oven	●
	1.6.28	7/2/2012	Direct-Fired Conveyorized Hotdog Cooking Oven	●
	1.6.29	7/12/2012	Indirect-fired Impingement Meatball Cooking Oven	●
	1.7.1	4/3/2000	Oven - Polyethylene Curing, = or < 20 MMBtu/hr	●
	1.7.2	8/19/1996	Oven - Plastisol curing/fusing, = or < 2.5 MMBtu/hr	●
	1.7.3	8/13/1999	Oven - Parts Cleaning, Burnoff or Burnout	●
	4.2.10	9/19/2019	Motor Vehicle Chassis Coating Operation - Electrodeposition with Curing Oven	●
	4.3.7	5/1/2020	Powder Coating Operation with Curing Oven	●
South Coast	4.7.1	6/25/1999	Offset Lithographic Printing - Publication Printing, High-end Graphics, Heatset using with a Drying	●
	4.8.7	1/25/1999	Fiberglass Products Manufacturing - Fiberglass Mat Dryer and Curing Oven	●
	4.12.3	8/28/2019	Chemical Evaporator / Dryer / Oven	●
	5.6.3	6/2/2002	Animal Feed Supplements - Steam-Heated Molasses Cooker	●
	n/a	2/2/2018	Dryer Or Oven, Carpet Oven, Rotary Dryer, Spray Dryer, Flash Dryer, Tray, Agitated Pan, Vacuum D Food Oven, Ribbon Burner, Direct Fired Burner, Infrared Burner, Add-On Control, Bakery Oven, Ye	●

This database identifies relevant BACT guidelines in South Coast AQMD and San Joaquin Valley APCD. These guidelines reviewed and discussed under each air District’s BACT clearinghouse search in the following sections.

South Coast AQMD BACT clearinghouse

The existing determinations under “Part B: Section I – SCAQMD LAER/BACT” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/i---scaqmd-laer-bact>). This section list a BACT guideline for a 5.774 MMBtu/hr tortilla chip oven was installed at Frito-Lay, Inc., at 9535 Archibald Ave in Rancho Cucamonga CA 91730 under App # 551284. The guideline does not establish any BACT standard for SOx emissions. For reference the BACT guideline is available at: http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/2-2-18_laer_fritolay_tort_chip_oven.pdf?sfvrsn=12.

The existing determinations under “Part B: Section II – Other LAER/BACT” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/ii---other-laer-bact>). No relevant BACT determination was found.

The existing determinations under “Part B: Section III – Other Technologies” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/iii---other-technologies>). No relevant BACT determination was found.

The draft LAER Part B, Section I and III Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_partb_draft_2-2-18.pdf?sfvrsn=6). No relevant BACT determination was found.

The draft document includes two BACT guidelines: 1.) the BACT guideline (prepared for App # 551284) discussed above, and 2.) the BACT guideline for another 1.6 MMBtu/hr snack food oven under App # 499293/551284.

The BACT guideline for App # 499293/551284 does not establish any SOx BACT standard.

Further, the draft Major Source, Part D Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_guidelines_partd_draft_2-2-18.pdf?sfvrsn=6). There is a relevant draft BACT for ovens. The final version of this guideline is as follows (<http://www.aqmd.gov/docs/default-source/bact/bact-guidelines/bact-guidelines-2022/part-d---bact-guidelines-for-non-major-polluting-facilities.pdf?sfvrsn=8>):

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

2-2-2018 Rev. 0

Equipment or Process: **Food Oven**

Subcategory ¹	Rating/ Size	Criteria Pollutants					Inorganic
		VOC	NOx	SOx	CO	PM10	
Ribbon Burner	> 500°F		60 ppmvd @ 3% O ₂ (2-2-2018)	Natural Gas (2-2-2018)	Compliance with applicable Rules 407 or 1153.1 (2-2-2018)	Natural Gas (2-2-2018)	
	≤ 500°F		30 ppmvd @ 3% O ₂ (2-2-2018)	Same as above	Same as above	Same as above	
Other Direct Fired Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Infrared Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Add-on Control for Bakery Oven processing yeast leavened products with emissions ≥ 30 lb VOC/day		Catalytic oxidizer with 95% overall control efficiency (mass basis); catalyst inlet temperature ≥ 600°F; ceramic prefilter (2-2-2018)	Compliance with Rule 1147 at the time of applicability (2-2-2018)				

¹Indirect Fired units may be subject to Rules 1146 and 1146.1 and BACT for Process Heater.

Bay Area AQMD BACT clearinghouse

The BACT guidelines available on BAAQMD website were reviewed (<http://www.baaqmd.gov/permits/permitting-manuals/bact-tbact-workbook>).

No relevant BACT guideline was found.

Sacramento Metro AQMD BACT Clearinghouse

The BACT guidelines available on the AQMD website were reviewed ([http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-\(bact\)](http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-(bact))). The following BACT guideline was found:

SMAQMD BACT CLEARINGHOUSE	
ACTIVE	
CATEGORY Type:	OVEN
BACT Category: Small Emitter BACT (PTE < 10 lb/day)	
BACT Determination Number: 292	BACT Determination Date: 8/17/2021
Equipment Information	
Permit Number: 28924	
Equipment Description: TORTILLA OVEN	
Unit Size/Rating/Capacity: Tortilla Oven ≤ 500 Deg. F	
Equipment Location: BERBER FOOD MANUFACTURING DBA MI RANCHO 10115 IRON ROCK WAY ELK GROVE, CA	
BACT Determination Information	
District Contact: Felix Trujillo Phone No.: (916) 874 - 7357 email: ftrujillo@airquality.org	
ROCs	Standard: Technology Description: Basis:
NOx	Standard: 30 ppmvd @ 3% O2 Technology Description: Low NOx Burner Basis: Achieved in Practice
SOx	Standard: 500 ppmvd @ 3% O2 Technology Description: Natural gas fuel or equivalent Basis: Achieved in Practice
PM10	Standard: Technology Description: Natural gas fuel or equivalent Basis: Achieved in Practice
PM2.5	Standard: Technology Description: Basis:
CO	Standard: 400 ppmvd @ 3% O2 Technology Description: Natural gas fuel or equivalent Basis: Achieved in Practice
LEAD	Standard: Technology Description: Basis:
Comments: T-BACT is equivalent to BACT for VOC.	

The guideline is available at:
<https://www.airquality.org/StationarySources/Documents/Tortilla%20Oven%20500%20F%20BACT%20292.pdf>

Note that this BACT guideline is for a direct-fired Tortilla Oven, and not a Tortilla Chip Oven. However, the emission standard and technologies appears to be transferrable to Tortilla Chip Ovens.

Also, note that SOx standard of 500 ppmvd @ 3% O₂ (as SO₂) equates to 0.844 lb-SO₂/MMBtu. This value is significantly more than a typical value of 0.00285 lb-SO₂/MMBtu estimated using maximum sulfur content of 1.0 gr-S/100 scf in PUC quality natural gas. Therefore, use of PUC quality gas is considered to be the achieved-in-practice standard.

SJVAPCD BACT clearinghouse

The current requirements in District BACT guideline 1.6.4 for snack ovens are summarized in the following table:

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
SOx	Use of natural gas fuel		

Packed bed/packed-tower wet scrubbers – Technologically Feasible Option

Typically, tortilla chip ovens use of PUC quality natural gas, which generates minimal amount of SO₂ emissions.

Packed bed/packed-tower wet scrubbers can be used to reduce SO₂ emissions. These devices are recommended when exhaust contain 250 ppm to 10,000 ppmv of pollutant concentration¹. The SO₂ exhaust concentration for natural gas combustion ovens is very low, estimated to be around 2 ppm of SO₂². This SO₂ concentration is already below the estimated outlet SO₂ concentration of 5 ppmv (5 ppmv, calculated using 98% efficiency and 250 ppm typical inlet concentration) of packed bed wet scrubbers. Furthermore, none of the BACT guidelines surveyed above recommends the use of this technology.

Therefore, this add-on control technology is not considered technologically feasible at this time, and it is removed from consideration.

Survey of Federal, State and Local Rules and Regulations

The following rules and regulations were consulted to determine whether any limits apply to tortilla chip ovens at commercial snack making operation to reduce SOx emissions:

¹ <https://www3.epa.gov/ttnca1/dir1/fpack.pdf>

² 0.00285 lb-SO₂/MMBtu x 379.5 dscf/lb-mol x MMBtu/8,578 dscf x lb-mol/64 lb-SO₂ x 10⁶ = 2 ppmv

:

- New Source Performance Standard
- CARB (no applicable rules)
- South Coast AQMD Regulation XI Rules
- Bay Area AQMD Rules
- Sacramento Metro AQMD Rules
- San Joaquin Valley APCD Regulation IV Rules

Title 40, Chapter I, Subchapter C, Part 60 – Standards of Performance for New Stationary Sources

There is no subpart that is applicable to snack chip production facilities.

Therefore, no further discussion is required. Subparts are available at:

<https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-60?toc=1>

CARB (no applicable rules)

CARB's website includes rules from local air district related to stationary sources.

South Coast AQMD Regulation XI Rules

Rules in Regulation VII (<http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/regulation-xi>) are reviewed.

Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (Last amended 11/7/2014)

The purpose of this rule is to reduce NO_x emissions from gaseous and liquid fuel-fired combustion equipment.

This rule applies to in-use ovens, dryers, smokers, and dry roaster with NO_x emissions from fuel combustion and are used to prepare food or products for making beverages for human consumption. This rule is not applicable to new units.

This rule does not list any standards for SO_x emissions. As such, no further discussion is necessary.

Bay Area AQMD Rules

BAAQMD rules (<https://www.baaqmd.gov/rules-and-compliance/current-rules>) were reviewed.

Regulation 6 Rule 2 – Commercial Cooking Equipment (12/5/07) was reviewed (<https://www.baaqmd.gov/~media/dotgov/files/rules/reg-6-rule-2-commercial-cooking-equipment/documents/rg0602.pdf?la=en&rev=42fc0966398c43f9b585572708a5ea70>). No requirement was found for snack chip ovens.

Sacramento Metro AQMD Rules

The AQMD regulation 4 was reviewed (<https://www.airquality.org/Businesses/Rules-Regulations>).

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

The purpose of this rule is to reduce NOx and CO emissions from gaseous and liquid fuel fired miscellaneous combustion units and cooking units.

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.

This rule does not list any standards for SOx emissions. As such, no further discussion is necessary.

San Joaquin Valley APCD Regulation IV Rules

Regulation IV (<https://www.valleyair.org/rules/1ruleslist.htm#reg4>) was reviewed.

Rule 4309 - Dryers, Dehydrators, and Ovens (12/15/05)

The purpose of this rule is to limit emissions of NOx and CO from dryers, dehydrators and ovens.

This rule applies to any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel or is fired on gaseous and liquid fuel sequentially, and the total heat input for the unit is 5.0 MMBtu/hr or greater.

Per section 4.1.4, the requirements of this rule are not applicable to units used to bake or fry food for human consumption.

Since the proposed oven is used to bake tortilla chip for human consumption, this unit is not subject to the requirements of this rule.

Survey of Source Tests For Snack Chip Ovens at Food Manufacturing Operations in the SJVAPCD:

Permit records were queried to identify snack chip ovens with active permits at snack chip manufacturing operations. Several units were identified (see **Appendix C** for complete list). These units are required to use PUC quality natural gas fuel. No units were tested for SOx emissions.

List of Control Options:

Based on the search of *BACT Clearinghouse Survey, Survey of Federal, State and Local Rules and Regulations and Survey of Source Tests For Tortilla Chip Ovens at Food Manufacturing Operations in the SJVAPCD*, discussed above, the following emission control options were developed:

Type of burner	Process Temperature	Achieved-in-Practice SOx Standard	Technologically feasible
Ribbon Burner	>500°F	Use of PUC quality natural gas (SCAQMD, SJVAPCD)	None
	≤500°F	Use of PUC quality natural gas SCAQMD, SJVAPCD, SMAQMD	None
Direct-fired/Infrared burner		Use of PUC quality natural gas SCAQMD, SJVAPCD, SMAQMD	

Step 2 - Eliminate Technologically Infeasible Options

There are no technologically infeasible options. As such, no further discussion is required.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
SOx	Use of PUC quality natural gas fuel	None	None

Step 4 - Cost Effectiveness Analysis

There is no technologically feasible or alternate basic equipment listed in Step 3 above. Therefore, cost-effectiveness analysis is not required.

Step 5 - Select BACT

The BACT for tortilla chip oven is to use PUC quality natural gas fuel to reduce SOx emissions.

C. BACT analysis for PM₁₀ Emissions

PM₁₀ emissions will generate from combustion of natural fuel in burners of tortilla chip ovens.

Step 1 - Identify All Possible Control Technologies

BACT Clearinghouse Survey:

The following BACT clearinghouses were consulted to determine whether any tortilla chip oven at commercial snack making operation have been required to employ emission controls to reduce PM₁₀ emissions:

- EPA RACT/BACT/LAER clearinghouse
- CARB BACT clearinghouse
- South Coast AQMD BACT clearinghouse
- Bay Area AQMD BACT clearinghouse
- Sacramento Metro AQMD BACT clearinghouse
- San Joaquin Valley APCD BACT clearinghouse

EPA RACT/BACT/LAER clearinghouse

The database was searched using the following criteria:

Permit Date: 1/1/2013 to 2/28/2023

Process Type: All Process Types

Process Name Contains: Tortilla oven, Food oven

Pollutant Name: All pollutants

No relevant results were found.

CARB BACT clearinghouse

The database (<https://ww2.arb.ca.gov/our-work/programs/technology-clearinghouse/clearinghouse-tools/bact-guidelines-tool>) was searched using the following criteria:

Search: oven

BACT Guideline List Data Last Updated 3/18/2022

Agency: (All) Date Filter: 6/27/1991 - 2/3/2022

Emitting Unit: (All) Emitting Unit Detail: (All)

Emitting Process: (All)

Search (Title, Agency, ID, Emitting Unit type and keywords, Emitting Process type and keywords): oven

Agency	District ID	Date	Title	
Bay Area	47.1.1	3/3/1992	Coffee Roaster - Coffee Roasting < 110,000 Btu/hr	
	111A.1	9/13/1991	Miscellaneous Operations - Meat Broiler and Barbecue Oven	
	161.4.3	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Topcoat and/or Primer)	
	161.4.4	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Sealer and/or Elpo)	
San Joaquin	1.5.5	10/19/2000	Glass Bottle Label Curing Lehr - < 10 MMBtu/hr, Natural Gas Fired	
	1.5.6	10/15/2014	Metal Heat Treatment Oven	
	1.6.1	4/14/2020	Vegetable Dry Roasting Operation	
	1.6.4	6/16/1999	Oven - Snack Food	
	1.6.7	1/27/1994	Pistachio Roasting Operation	
	1.6.10	7/30/1998	Oven - Wheat Drying, < or = 10 MMBtu/hour	
	1.6.24	12/30/2020	Commercial Bakery Oven	
	1.6.28	7/2/2012	Direct-Fired ConveyORIZED Hotdog Cooking Oven	
	1.6.29	7/12/2012	Indirect-fired Impingement Meatball Cooking Oven	
	1.7.1	4/3/2000	Oven - Polyethylene Curing, = or < 20 MMBtu/hr	
	1.7.2	8/19/1996	Oven - Plastisol curing/fusing, = or < 2.5 MMBtu/hr	
	1.7.3	8/13/1999	Oven - Parts Cleaning, Burnoff or Burnout	
	4.2.10	9/19/2019	Motor Vehicle Chassis Coating Operation - Electrodeposition with Curing Oven	
	4.3.7	5/1/2020	Powder Coating Operation with Curing Oven	
	4.7.1	6/25/1999	Offset Lithographic Printing - Publication Printing, High-end Graphics, Heatset using with a Drying	
	4.8.7	1/25/1999	Fiberglass Products Manufacturing - Fiberglass Mat Dryer and Curing Oven	
4.12.3	8/28/2019	Chemical Evaporator / Dryer / Oven		
5.6.3	6/2/2002	Animal Feed Supplements - Steam-Heated Molasses Cooker		
South Coast	n/a	2/2/2018	Dryer Or Oven, Carpet Oven, Rotary Dryer, Spray Dryer, Flash Dryer, Tray, Agitated Pan, Vacuum D	
			Food Oven, Ribbon Burner, Direct Fired Burner, Infrared Burner, Add-On Control, Bakery Oven, Ye	

This database identifies relevant BACT guidelines in South Coast AQMD and San Joaquin Valley APCD. These guidelines reviewed and discussed under each air District's BACT clearinghouse search in the following sections.

South Coast AQMD BACT clearinghouse

The existing determinations under “Part B: Section I – SCAQMD LAER/BACT” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/i---scaqmd-laer-bact>). This section list a BACT guideline for a 5.774 MMBtu/hr tortilla chip oven was installed at Frito-Lay, Inc., at 9535 Archibald Ave in Rancho Cucamonga CA 91730 under App # 551284. The guideline does not establish any BACT standard for PM10 emissions. For reference the BACT guideline is available at: <http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/2-2-18-laer-fritolay-tort-chip-oven.pdf?sfvrsn=12>.

The existing determinations under “Part B: Section II – Other LAER/BACT” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/ii---other-laer-bact>). No relevant BACT determination was found.

The existing determinations under “Part B: Section III – Other Technologies” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/iii---other-technologies>). No relevant BACT determination was found.

The draft LAER Part B, Section I and III Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_partb_draft_2-2-18.pdf?sfvrsn=6). No relevant BACT determination was found.

The draft document includes two BACT guidelines: 1.) the BACT guideline (prepared for App # 551284) discussed above, and 2.) the BACT guideline for another 1.6 MMBtu/hr snack food oven under App # 499293/551284.

The BACT guideline for App # 499293/551284 does not establish any PM₁₀ BACT standard.

Further, the draft Major Source, Part D Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_guidelines_partd_draft_2-2-18.pdf?sfvrsn=6). There is a relevant draft BACT for ovens. The final version of this guideline is as follows (<http://www.aqmd.gov/docs/default-source/bact/bact-guidelines/bact-guidelines-2022/part-d---bact-guidelines-for-non-major-polluting-facilities.pdf?sfvrsn=8>):

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

2-2-2018 Rev. 0

Equipment or Process: **Food Oven**

Subcategory ¹	Rating/ Size	Criteria Pollutants					Inorganic
		VOC	NOx	SOx	CO	PM10	
Ribbon Burner	> 500°F		60 ppmvd @ 3% O ₂ (2-2-2018)	Natural Gas (2-2-2018)	Compliance with applicable Rules 407 or 1153.1 (2-2-2018)	Natural Gas (2-2-2018)	
	≤ 500°F		30 ppmvd @ 3% O ₂ (2-2-2018)	Same as above	Same as above	Same as above	
Other Direct Fired Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Infrared Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Add-on Control for Bakery Oven processing yeast leavened products with emissions ≥ 30 lb VOC/day		Catalytic oxidizer with 95% overall control efficiency (mass basis); catalyst inlet temperature ≥ 600°F; ceramic prefilter (2-2-2018)	Compliance with Rule 1147 at the time of applicability (2-2-2018)				

¹Indirect Fired units may be subject to Rules 1146 and 1146.1 and BACT for Process Heater.

Bay Area AQMD BACT clearinghouse

The BACT guidelines available on BAAQMD website were reviewed (<http://www.baaqmd.gov/permits/permitting-manuals/bact-tbact-workbook>).

No relevant BACT guideline was found.

Sacramento Metro AQMD BACT Clearinghouse

The BACT guidelines available on the AQMD website were reviewed ([http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-\(bact\)](http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-(bact))). The following BACT guideline was found:

SMAQMD BACT CLEARINGHOUSE		
ACTIVE		
CATEGORY Type:	OVEN	
BACT Category: Small Emitter BACT (PTE < 10 lb/day)		
BACT Determination Number: 292	BACT Determination Date: 8/17/2021	
Equipment Information		
Permit Number: 28924		
Equipment Description: TORTILLA OVEN		
Unit Size/Rating/Capacity: Tortilla Oven ≤ 500 Deg. F		
Equipment Location: BERBER FOOD MANUFACTURING DBA MI RANCHO 10115 IRON ROCK WAY ELK GROVE, CA		
BACT Determination Information		
District Contact: Felix Trujillo Phone No.: (916) 874 - 7357 email: ftrujillo@airquality.org		
ROCs	Standard:	
	Technology Description:	
	Basis:	
NOx	Standard:	30 ppmvd @ 3% O2
	Technology Description:	Low NOx Burner
	Basis:	Achieved in Practice
SOx	Standard:	500 ppmvd @ 3% O2
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved in Practice
PM10	Standard:	Natural gas fuel or equivalent
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved in Practice
PM2.5	Standard:	
	Technology Description:	
	Basis:	
CO	Standard:	400 ppmvd @ 3% O2
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved in Practice
LEAD	Standard:	
	Technology Description:	
	Basis:	
Comments: T-BACT is equivalent to BACT for VOC.		

The guideline is available at:

<https://www.airquality.org/StationarySources/Documents/Tortilla%20Oven%20500%20F%20BACT%20292.pdf>

Note that this BACT guideline is for a direct-fired Tortilla Oven, and not the Tortilla Chip Oven. However, the emission standard and technologies appears to be transferrable to Tortilla Chip Ovens.

Use of PUC quality gas is an achieved-in-practice standard to reduce PM10 emissions.

SJVAPCD BACT clearinghouse

The current requirements in District BACT guideline 1.6.4 for snack ovens are summarized in the following table:

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
PM ₁₀	Use of PUC quality natural gas fuel		

Baghouse – Technologically Feasible Option

In general, a baghouse can be used to reduce PM₁₀ emissions. Use of baghouse is recommended for exhaust streams with PM₁₀ inlet grain loading of 0.5-10 gr/ft³ of air flow.

PM₁₀ grain loading concentration noted above (0.5 -10 gr/ft³) is an order of magnitude above the estimated 0.05 gr/ft³ exhaust PM₁₀ concentrations generated by a typical tortilla chip oven using natural gas fuel. Furthermore, none of the BACT guideline surveyed above recommend the use of this technology.

Therefore, further evaluation of this add-on control technology is not recommended.

Survey of Federal, State and Local Rules and Regulations

The following rules and regulations were consulted to determine whether any limits apply to tortilla chip ovens at commercial snack making operation to reduce PM₁₀ emissions:

- New Source Performance Standard
- CARB (no applicable rules)
- South Coast AQMD Regulation XI Rules
- Bay Area AQMD Rules
- Sacramento Metro AQMD Rules
- San Joaquin Valley APCD Regulation IV Rules

Title 40, Chapter I, Subchapter C, Part 60 – Standards of Performance for New Stationary Sources

There is no subpart that is applicable to snack chip production facilities.

Therefore, no further discussion is required. Subparts are available at:

<https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-60?toc=1>

CARB (no applicable rules)

CARB's website includes rules from local air district related to stationary sources.

South Coast AQMD Regulation XI Rules

Rules in Regulation VII (<http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/regulation-xi>) are reviewed.

Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (Last amended 11/7/2014)

The purpose of this rule is to reduce NO_x emissions from gaseous and liquid fuel-fired combustion equipment.

This rule applies to in-use ovens, dryers, smokers, and dry roaster with NO_x emissions from fuel combustion and are used to prepare food or products for making beverages for human consumption. This rule is not applicable to new units.

This rule does not list any standards for PM₁₀ emissions. As such, no further discussion is necessary.

Bay Area AQMD Rules

BAAQMD rules (<https://www.baaqmd.gov/rules-and-compliance/current-rules>) were reviewed.

Regulation 6 Rule 2 – Commercial Cooking Equipment (12/5/07) was reviewed (<https://www.baaqmd.gov/~media/dotgov/files/rules/reg-6-rule-2-commercial-cooking-equipment/documents/rq0602.pdf?la=en&rev=42fc0966398c43f9b585572708a5ea70>). No requirement was found for snack chip ovens.

Sacramento Metro AQMD Rules

The AQMD regulation 4 was reviewed (<https://www.airquality.org/Businesses/Rules-Regulations>).

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

The purpose of this rule is to reduce NO_x and CO emissions from gaseous and liquid fuel fired miscellaneous combustion units and cooking units.

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 NO_x 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 NO_x.

This rule does not list any standards for PM₁₀ emissions. As such, no further discussion is necessary.

San Joaquin Valley APCD Regulation IV Rules

Regulation IV (<https://www.valleyair.org/rules/1ruleslist.htm#reg4>) was reviewed.

Rule 4309 - Dryers, Dehydrators, and Ovens (12/15/05)

The purpose of this rule is to limit emissions of NOx and CO from dryers, dehydrators and ovens.

This rule applies to any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel or is fired on gaseous and liquid fuel sequentially, and the total heat input for the unit is 5.0 MMBtu/hr or greater.

Per section 4.1.4, the requirements of this rule are not applicable to units used to bake or fry food for human consumption.

Since the proposed oven is used to bake tortilla chip for human consumption, this unit is not subject to the requirements of this rule.

Survey of Source Tests For Snack Chip Ovens at Food Manufacturing Operations in the SJVAPCD:

Permit records were queried to identify snack chip ovens with active permits at snack chip manufacturing operations. Several units were identified (see **Appendix C** for complete list). These units are required to use PUC quality natural gas fuel. No units were tested for PM₁₀ emissions.

List of Control Options:

Based on the search of *BACT Clearinghouse Survey, Survey of Federal, State and Local Rules and Regulations and Survey of Source Tests For Tortilla Chip Ovens at Food Manufacturing Operations in the SJVAPCD*, discussed above, the following emission control options were developed:

Type of burner	Process Temperature	Achieved-in-Practice PM10 Standard	Technologically Feasible
Ribbon Burner	>500°F	Use of PUC quality natural gas (Source: SCAQMD, SJVAPCD)	None
	≤500°F	Use of PUC quality natural gas (Source: SCAQMD, SJVAPCD, SMAQMD)	None
Direct-fired/Infra-red burner		Use of PUC quality natural gas (Source: SCAQMD, SJVAPCD, SMAQMD)	

Step 2 - Eliminate Technologically Infeasible Options

There are no technologically infeasible options. As such, no further discussion is required.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
PM ₁₀	Use of PUC quality natural gas fuel	None	None

Step 4 - Cost Effectiveness Analysis

There is no technologically feasible or alternate basic equipment listed in Step 3 above. Therefore, cost-effectiveness analysis is not required.

Step 5 - Select BACT

The BACT for the proposed tortilla chip oven is to use PUC quality natural gas fuel to reduce PM₁₀ emissions.

D. BACT analysis for CO Emissions

CO emissions will generate from combustion of natural gas in oven burner(s).

Step 1 - Identify All Possible Control Technologies

BACT Clearinghouse Survey:

The following BACT clearinghouses were consulted to determine whether any tortilla chip oven at commercial snack making operation have been required to employ emission controls to reduce CO emissions:

- EPA RACT/BACT/LAER clearinghouse
- CARB BACT clearinghouse
- South Coast AQMD BACT clearinghouse
- Bay Area AQMD BACT clearinghouse
- Sacramento Metro AQMD BACT clearinghouse
- San Joaquin Valley APCD BACT clearinghouse

EPA RACT/BACT/LAER clearinghouse

The database was searched using the following criteria:

Permit Date: 1/1/2013 to 2/28/2023

Process Type: All Process Types

Process Name Contains: Tortilla oven, Food oven

Pollutant Name: All pollutants

No relevant results were found.

CARB BACT clearinghouse

The database (<https://ww2.arb.ca.gov/our-work/programs/technology-clearinghouse/clearinghouse-tools/bact-guidelines-tool>) was searched using the following criteria: oven

BACT Guideline List Data Last Updated 3/18/2022

Agency: (All) Date Filter: 6/27/1991 to 2/3/2022

Emitting Unit: (All) Emitting Unit Detail: (All)

Emitting Process: (All)

Search (Title, Agency, ID, Emitting Unit type and keywords, Emitting Process type and keywords): oven

Agency	District ID	Date	Title
Bay Area	47.1.1	3/3/1992	Coffee Roaster - Coffee Roasting < 110,000 Btu/hr
	111A.1	9/13/1991	Miscellaneous Operations - Meat Broiler and Barbecue Oven
	161.4.3	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Topcoat and/or Primer)
	161.4.4	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Sealer and/or Elpo)
San Joaquin	1.5.5	10/19/2000	Glass Bottle Label Curing Lehr - < 10 MMBtu/hr, Natural Gas Fired
San Joaquin	1.5.6	10/15/2014	Metal Heat Treatment Oven
	1.6.1	4/14/2020	Vegetable Dry Roasting Operation
	1.6.4	6/16/1999	Oven - Snack Food
	1.6.7	1/27/1994	Pistachio Roasting Operation
	1.6.10	7/30/1998	Oven - Wheat Drying, < or = 10 MMBtu/hour
	1.6.24	12/30/2020	Commercial Bakery Oven
	1.6.28	7/2/2012	Direct-Fired Conveyorized Hotdog Cooking Oven
	1.6.29	7/12/2012	Indirect-fired Impingement Meatball Cooking Oven
	1.7.1	4/3/2000	Oven - Polyethylene Curing, = or < 20 MMBtu/hr
	1.7.2	8/19/1996	Oven - Plastisol curing/fusing, = or < 2.5 MMBtu/hr
	1.7.3	8/13/1999	Oven - Parts Cleaning, Burnoff or Burnout
	4.2.10	9/19/2019	Motor Vehicle Chassis Coating Operation - Electrodeposition with Curing Oven
	4.3.7	5/1/2020	Powder Coating Operation with Curing Oven
	4.7.1	6/25/1999	Offset Lithographic Printing - Publication Printing, High-end Graphics, Heatset using with a Drying
	4.8.7	1/25/1999	Fiberglass Products Manufacturing - Fiberglass Mat Dryer and Curing Oven
	4.12.3	8/28/2019	Chemical Evaporator / Dryer / Oven
	5.6.3	6/2/2002	Animal Feed Supplements - Steam-Heated Molasses Cooker
South Coast	n/a	2/2/2018	Dryer Or Oven, Carpet Oven, Rotary Dryer, Spray Dryer, Flash Dryer, Tray, Agitated Pan, Vacuum Drying Oven, Ribbon Burner, Direct Fired Burner, Infrared Burner, Add-On Control, Bakery Oven, Yeast

This database identifies relevant BACT guidelines in South Coast AQMD and San Joaquin Valley APCD. These guidelines will be reviewed and discussed under each air District's BACT clearinghouse sections below.

South Coast AQMD BACT clearinghouse

The existing determinations under "Part B: Section I – SCAQMD LAER/BACT" were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/i---scaqmd-laer-bact>). This section has one relevant BACT guideline for a tortilla chip oven, which is discussed below:

A 5.774 MMBtu/hr tortilla chip oven was installed at Frito-Lay, Inc., at 9535 Archibald Ave in Rancho Cucamonga CA 91730 under App # 551284. The oven startup date was March 17, 2014. This oven is used to dry and bake tortilla chips. The oven is equipped with infra-red burners to dry masa and ribbon burners to bake masa into tortilla chips prior to cooking dried chips in a deep fat oil fryer. This oven was source tested on January 13, 2015; NOx results were 43 ppmvd NOx @ 3% O₂, and 36 ppmv CO at stack conditions. The oven average temperature was 357°F during the test. The guideline mentions that source test prior to the January 13, 2015 test determined 53.7 ppmv NOx @ 3% O₂. The BACT guideline established for this unit set NOx standard at 54 ppmvd NOx @ 3% O₂, averaged over 1 hour. For reference the BACT guideline is available at: http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/2-2-18_laer_fritolay_tort_chip_oven.pdf?sfvrsn=12. The BACT guideline also cites that an identical unit D-86 at this site was also tested; the test results were 22.9 ppmvd NOx @ 3% O₂ and 85 ppmv CO at stack conditions.

The existing determinations under "Part B: Section II – Other LAER/BACT" were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/ii---other-laer-bact>). No relevant BACT determination was found.

The existing determinations under "Part B: Section III – Other Technologies" were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/iii---other-technologies>). No relevant BACT determination was found.

The draft LAER Part B, Section I and III Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_partb_draft_2-2-18.pdf?sfvrsn=6). No relevant BACT determination was found.

The draft document includes two BACT guidelines:

- 1.) the BACT guideline (prepared for App # 551284) is discussed above, and
- 2.) the BACT guideline for another 1.6 MMBtu/hr snack food oven under App # 499293/551284 was identified. This requirements in the guidelines are discussed below:

The BACT guideline covers (item 2 above) a 1.6 MMBtu/hr natural gas fired food oven used, which is used to bake corn meal cheese puffs. The oven start-up date was April 15, 2008. The oven is equipped with Maxon's Cyclomax burner system. This oven was tested for NOx and CO emissions on April 29, 2009. The results were 20 ppmv NOx @ 3% O₂ (0.024 lb-NOx/MMBtu) and 58 ppmv CO @ 3% O₂ (0.043 lb-CO/MMBtu). The oven was operating at 298°F during the test. This oven's NOx and CO emissions are less than the tortilla chip oven as this oven was operated at lower temperature, and is equipped with Maxon's cyclomax burners (cabinet burners) typically located outside the oven as opposed to infrared or ribbon style burners inside the oven typically used in tortilla chip ovens. SCAQMD considered the results of this oven in establishing BACT standard of 30 ppmvd @ 3% O₂ (0.036 lb-NOx/MMBtu) in 2018 (see below).

Further, the draft Major Source, Part D Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_guidelines_partd_draft_2-2-18.pdf?sfvrsn=6). There is a relevant draft BACT for ovens. The final version of this guideline is as follows (<http://www.aqmd.gov/docs/default-source/bact/bact-guidelines/bact-guidelines-2022/part-d---bact-guidelines-for-non-major-polluting-facilities.pdf?sfvrsn=8>):

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

2-2-2018 Rev. 0

Equipment or Process: Food **Oven**

Subcategory ¹	Rating/ Size	Criteria Pollutants					Inorganic
		VOC	NOx	SOx	CO	PM10	
Ribbon Burner	> 500°F		60 ppmvd @ 3% O ₂ (2-2-2018)	Natural Gas (2-2-2018)	Compliance with applicable Rules 407 or 1153.1 (2-2-2018)	Natural Gas (2-2-2018)	
	≤ 500°F		30 ppmvd @ 3% O ₂ (2-2-2018)	Same as above	Same as above	Same as above	
Other Direct Fired Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Infrared Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Add-on Control for Bakery Oven processing yeast leavened products with emissions ≥ 30 lb VOC/day		Catalytic oxidizer with 95% overall control efficiency (mass basis); catalyst inlet temperature ≥ 600°F; ceramic prefilter (2-2-2018)	Compliance with Rule 1147 at the time of applicability (2-2-2018)				

¹Indirect Fired units may be subject to Rules 1146 and 1146.1 and BACT for Process Heater.

Bay Area AQMD BACT clearinghouse

The BACT guidelines available on BAAQMD website were reviewed (<http://www.baaqmd.gov/permits/permitting-manuals/bact-tbact-workbook>).

No relevant BACT guideline was found.

Sacramento Metro AQMD BACT Clearinghouse

The BACT guidelines available on the AQMD website were reviewed ([http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-\(bact\)](http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-(bact))). The following BACT guideline was found:

SMAQMD BACT CLEARINGHOUSE

ACTIVE

CATEGORY Type:		OVEN
BACT Category: Small Emitter BACT (PTE < 10 lb/day)		
BACT Determination Number:	292	BACT Determination Date: 8/17/2021
Equipment Information		
Permit Number:	28924	
Equipment Description:	TORTILLA OVEN	
Unit Size/Rating/Capacity:	Tortilla Oven ≤ 500 Deg. F	
Equipment Location:	BERBER FOOD MANUFACTURING DBA MI RANCHO 10115 IRON ROCK WAY ELK GROVE, CA	
BACT Determination Information		
District Contact: Felix Trujillo Phone No.: (916) 874 - 7357 email: ftrujillo@airquality.org		
ROCs	Standard:	
	Technology Description:	
	Basis:	
NOx	Standard:	30 ppmvd @ 3% O2
	Technology Description:	Low NOx Burner
	Basis:	Achieved In Practice
SOx	Standard:	500 ppmvd @ 3% O2
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved In Practice
PM10	Standard:	Natural gas fuel or equivalent
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved In Practice
PM2.5	Standard:	
	Technology Description:	
	Basis:	
CO	Standard:	400 ppmvd @ 3% O2
	Technology Description:	Natural gas fuel or equivalent
	Basis:	Achieved In Practice
LEAD	Standard:	
	Technology Description:	
	Basis:	
Comments: T-BACT is equivalent to BACT for VOC.		

The guideline is available at:

<https://www.airquality.org/StationarySources/Documents/Tortilla%20Oven%20500%20F%20BACT%20292.pdf>

Note that this BACT guideline is for a direct-fired Tortilla Oven, and not the Tortilla Chip Oven. However, the emission standard and technologies appears to be transferrable to Tortilla Chip Ovens.

SJVAPCD BACT clearinghouse

The current requirements in District BACT guideline 1.6.4 for snack ovens are summarized in the following table:

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
CO	Use of PUC quality natural gas fuel		

Oxidation Catalyst – Technologically Feasible Option

In general, an oxidation catalyst can be used to reduce CO or VOC. Oxidation catalyst must operate around 800°F to effectively reduce VOC or CO emissions.

Exhaust temperature of tortilla chip oven generally around 350-400°F. Therefore, this emission control cannot be used unless the process stream is heated to raise the temperature. This practice would result in an increase in collateral NOx, CO and other pollutants. Furthermore, none of the BACT guideline surveyed above recommend the use of this technology. Therefore, further evaluation of this add-on control technology is not recommended.

Survey of Federal, State and Local Rules and Regulations

The following rules and regulations were consulted to determine whether any limits apply to tortilla chip ovens at commercial snack making operation to reduce CO emissions:

- New Source Performance Standard
- CARB (no applicable rules)
- South Coast AQMD Regulation XI Rules
- Bay Area AQMD Rules
- Sacramento Metro AQMD Rules
- San Joaquin Valley APCD Regulation IV Rules

Title 40, Chapter I, Subchapter C, Part 60 – Standards of Performance for New Stationary Sources

There is no subpart that is applicable to snack chip production facilities.

Therefore, no further discussion is required. Subparts are available at:

<https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-60?toc=1>

CARB (no applicable rules)

CARB's website includes rules from local air district related to stationary sources.

South Coast AQMD Regulation XI Rules

Rules in Regulation VII (<http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/regulation-xi>) are reviewed.

Rule 1147 – NO_x Reductions from Miscellaneous Sources (Last amended 7/7/2017)

The purpose of this rule is to reduce NO_x emissions from gaseous and liquid fuel fired combustion equipment.

Per section (g)(2), this rule does not apply to charbroilers or food ovens.

Therefore, this rule is not applicable to this BACT Determination.

Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (Last amended 11/7/2014)

The purpose of this rule is to reduce NO_x emissions from gaseous and liquid fuel-fired combustion equipment.

This rule applies to in-use ovens, dryers, smokers, and dry roaster with NO_x emissions from fuel combustion and are used to prepare food or products for making beverages for human consumption. This rule is not applicable to new units.

Any person owning or operating an in-use unit (in operation prior to Nov 7, 2014) subject to this rule shall not operate the unit in a manner that exceeds 40 ppmv NO_x @ 3% O₂ for units with process temperature ≤500°F, and 60 ppmv NO_x @ 3% O₂ for units with process temperature >500°F. CO emissions shall not exceed 800 ppmv @ 3% O₂.

Bay Area AQMD Rules

BAAQMD rules (<https://www.baaqmd.gov/rules-and-compliance/current-rules>) were reviewed.

Regulation 6 Rule 2 – Commercial Cooking Equipment (12/5/07) was reviewed (<https://www.baaqmd.gov/~media/dotgov/files/rules/reg-6-rule-2-commercial-cooking->

[equipment/documents/rg0602.pdf?la=en&rev=42fc0966398c43f9b585572708a5ea70](https://www.airquality.org/equipment/documents/rg0602.pdf?la=en&rev=42fc0966398c43f9b585572708a5ea70)). No requirements were found for snack chip ovens.

Sacramento Metro AQMD Rules

The AQMD regulation 4 was reviewed

(<https://www.airquality.org/Businesses/Rules-Regulations>).

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

The purpose of this rule is to reduce NO_x and CO emissions from gaseous and liquid fuel fired miscellaneous combustion units and cooking units.

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 NO_x 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 NO_x.

Per section 302, Table 2, cooking units, NO_x shall not exceed 40 ppmv @ 3% O₂ for units operating at less than 500°F process temperature and 60 ppmv @ 3% O₂ for units operating at equal to or greater than 500°F. CO shall not exceed 800 ppm @ 3% O₂ for any unit.

San Joaquin Valley APCD Regulation IV Rules

Regulation IV (<https://www.valleyair.org/rules/1ruleslist.htm#reg4>) was reviewed.

Rule 4309 - Dryers, Dehydrators, and Ovens (12/15/05)

The purpose of this rule is to limit emissions of NO_x and CO from dryers, dehydrators and ovens.

This rule applies to any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel or is fired on gaseous and liquid fuel sequentially, and the total heat input for the unit is 5.0 MMBtu/hr or greater.

Per section 4.1.4, the requirements of this rule are not applicable to units used to bake or fry food for human consumption.

Since the proposed oven is used to bake tortilla chip for human consumption, this unit is not subject to the requirements of this rule.

Survey of Source Tests For Snack Chip Ovens at Food Manufacturing Operations in the SJVAPCD:

Permits records were queried to identify snack chip ovens with active permits at snack chip manufacturing operations. Several units were identified (see

Appendix C for a complete list). Results from latest source test report available in permits database were noted for the tested units.

Facility Name	Permit #	Equipment Description	Source test data/other relevant information
FRITO-LAY INC	S-2076-4-9	TORTILLA CHIP LINE #1 WITH CONVEYORIZED OIL FRYER, HEAT EXCHANGER, SEASONER, 6.83 MMBTU/HR NATURAL GAS FIRED CASA HERRERA OVEN, AND ONE AMBIENT AIR COOLER SERVED BY HIGH VELOCITY DUCT FILTER AND HEAT RECOVERY AND HOT WATER STORAGE SYSTEM SHARED WITH S-2076-5	<p><u>Permitted Rate</u> 223 ppmv CO @ 15% O₂ (0.497 lb/MMBtu)</p> <p><u>Source Test (12/22/21)</u> 216.35 ppmv CO @ 15% O₂ (0.482 lb-CO/MMBtu)</p>
FRITO-LAY INC	S-2076-5-9	TORTILLA CHIP LINE #2 WITH CONVEYORIZED OIL FRYER, HEAT EXCHANGER, SEASONER, 6.83 MMBTU/HR NATURAL GAS FIRED CASA HERRERA OVEN, AND ONE AMBIENT AIR COOLER SERVED BY HIGH VELOCITY DUCT FILTER AND HEAT RECOVERY AND HOT WATER STORAGE SYSTEM SHARED WITH S-2076-4	<p><u>Permitted Rate</u> 223 ppmv CO @ 15% O₂ (0.497 lb/MMBtu)</p> <p><u>Source Test (9/30/20)</u> 202.2 ppmv CO @ 15% O₂ (0.451 lb-CO/MMBtu)</p>
FRITO-LAY INC	S-2076-17-8	BAKED LINE #1 INCLUDING A 9.76 MMBTU/HR NATURAL GAS-FIRED BAKING OVEN, 10 MMBTU/HR NATURAL GAS-FIRED PRIMARY DRYER, STEAM HEATED FRYER WITH OIL MIST ELIMINATOR AND AMBIENT AIR COOLER	<p><u>Source Test (6/5/20)</u> 1,173 ppmvd CO @ 3% O₂</p>
FRITO-LAY INC	S-2076-21-16	9.56 MMBTU/HR TORTILLA CHIP LINE #3, INCLUDING: 9.56 MMBTU/HR OVEN, FRYER, SEASONER, AIR COOLER, AND ON MACHINE SEASONING (OMS) SYSTEM SERVED BY DUST COLLECTOR	<p><u>Permitted Rate</u> 0.292lb-CO/MMBtu (oven)</p> <p><u>Source Test (12/20/19)</u> 0.2512 lb-CO/MMBtu (342.8 ppmvd @ 3% O₂)</p>

The following conclusions were drawn from the above table:

- Lowest CO emission rate was 342.8 ppmv @ 3% O₂ for a 9.56 MMBtu/hr natural gas-fired baking oven (S-2076-21-16) during a source test on 12/20/2019
- All units are fired on natural gas fuel.

List of Control Options:

Based on the search of *BACT Clearinghouse Survey, Survey of Federal, State and Local Rules and Regulations and Survey of Source Tests For Snack Chip*

Ovens at Food Manufacturing Operations in the SJVAPCD, discussed above, the following emission control options were developed:

Type of burner	Process Temperature	Achieved-in-Practice CO Standard	Technologically Feasible CO Standard
Any	Any	400 ppmvd @ 3% O ₂ and use of PUC quality natural gas* (SMAQMD, source test under SJVAPCD permit S-2076-21-16)	None

Step 2 - Eliminate Technologically Infeasible Options

There are no technologically infeasible options. As such, no further discussion is required.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
CO	400 ppmvd @ 3% O ₂ and use of PUC quality natural gas	None	None

Step 4 - Cost Effectiveness Analysis

There is no technologically feasible or alternate basic equipment listed in Step 3 above. Therefore, cost-effectiveness analysis is not required.

Step 5 - Select BACT

The BACT for the proposed tortilla chip oven is to achieve 400 ppmvd CO @ 3% O₂ and use PUC quality natural gas fuel to reduce CO emissions.

E. BACT analysis for VOC Emissions

VOC emissions will generate from combustion of gaseous fuel in burners of snack chip ovens.

Step 1 - Identify All Possible Control Technologies

BACT Clearinghouse Survey:

The following BACT clearinghouses were consulted to determine whether any tortilla chip oven at commercial snack making operation have been required to employ emission controls to reduce VOC emissions:

- EPA RACT/BACT/LAER clearinghouse
- CARB BACT clearinghouse
- South Coast AQMD BACT clearinghouse
- Bay Area AQMD BACT clearinghouse
- Sacramento Metro AQMD BACT clearinghouse
- San Joaquin Valley APCD BACT clearinghouse

EPA RACT/BACT/LAER clearinghouse

The database was searched using the following criteria:

Permit Date: 1/1/2013 to 2/28/2023

Process Type: All Process Types

Process Name Contains: Tortilla oven, Food oven

Pollutant Name: All pollutants

No relevant results were found.

CARB BACT clearinghouse

The database (<https://ww2.arb.ca.gov/our-work/programs/technology-clearinghouse/clearinghouse-tools/bact-guidelines-tool>) was searched using the following criteria:

Search: oven

BACT Guideline List Data Last Updated 3/18/2022

Agency: (All) Date Filter: 6/27/1991 - 2/3/2022

Emitting Unit: (All) Emitting Unit Detail: (All)

Emitting Process: (All)

Search (Title, Agency, ID, Emitting Unit type and keywords, Emitting Process type and keywords): oven

Agency	District ID	Date	Title
Bay Area	47.1.1	3/3/1992	Coffee Roaster - Coffee Roasting < 110,000 Btu/hr
	111A.1	9/13/1991	Miscellaneous Operations - Meat Broiler and Barbecue Oven
	161.4.3	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Topcoat and/or Primer)
	161.4.4	6/9/1995	Motor Vehicle Assembly Plant Coating - Oven (Sealer and/or Elpo)
San Joaquin	1.5.5	10/19/2000	Glass Bottle Label Curing Lehr - < 10 MMBtu/hr, Natural Gas Fired
San Joaquin	1.5.6	10/15/2014	Metal Heat Treatment Oven
	1.6.1	4/14/2020	Vegetable Dry Roasting Operation
	1.6.4	6/16/1999	Oven - Snack Food
	1.6.7	1/27/1994	Pistachio Roasting Operation
	1.6.10	7/30/1998	Oven - Wheat Drying, < or = 10 MMBtu/hour
	1.6.24	12/30/2020	Commercial Bakery Oven
	1.6.28	7/2/2012	Direct-Fired ConveyORIZED Hotdog Cooking Oven
	1.6.29	7/12/2012	Indirect-fired Impingement Meatball Cooking Oven
	1.7.1	4/3/2000	Oven - Polyethylene Curing, = or < 20 MMBtu/hr
	1.7.2	8/19/1996	Oven - Plastisol curing/fusing, = or < 2.5 MMBtu/hr
	1.7.3	8/13/1999	Oven - Parts Cleaning, Burnoff or Burnout
	4.2.10	9/19/2019	Motor Vehicle Chassis Coating Operation - Electrodeposition with Curing Oven
	4.3.7	5/1/2020	Powder Coating Operation with Curing Oven
	4.7.1	6/25/1999	Offset Lithographic Printing - Publication Printing, High-end Graphics, Heatset using with a Drying
	4.8.7	1/25/1999	Fiberglass Products Manufacturing - Fiberglass Mat Dryer and Curing Oven
	4.12.3	8/28/2019	Chemical Evaporator / Dryer / Oven
	5.6.3	6/2/2002	Animal Feed Supplements - Steam-Heated Molasses Cooker
South Coast	n/a	2/2/2018	Dryer Or Oven, Carpet Oven, Rotary Dryer, Spray Dryer, Flash Dryer, Tray, Agitated Pan, Vacuum D Food Oven, Ribbon Burner, Direct Fired Burner, Infrared Burner, Add-On Control, Bakery Oven, Ye

This database identifies relevant BACT guidelines in South Coast AQMD and San Joaquin Valley APCD. These guidelines reviewed and discussed under each air district’s BACT clearinghouse search in the following sections.

South Coast AQMD BACT clearinghouse

The existing determinations under “Part B: Section I – SCAQMD LAER/BACT” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/i---scaqmd-laer-bact>). This section list a BACT guideline for a 5.774 MMBtu/hr tortilla chip oven was installed at Frito-Lay, Inc., at 9535 Archibald Ave in Rancho Cucamonga CA 91730 under App # 551284. The guideline does not establish any BACT standard for VOC emissions. For reference the BACT guideline is available at: <http://www.aqmd.gov/docs/default-source/bact/laer-bact-determinations/aqmd-laer-bact/2-2-18-laer-fritolay-tort-chip-oven.pdf?sfvrsn=12>.

The existing determinations under “Part B: Section II – Other LAER/BACT” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/ii---other-laer-bact>). No relevant BACT determination was found.

The existing determinations under “Part B: Section III – Other Technologies” were reviewed (<http://www.aqmd.gov/home/permits/bact/guidelines/iii---other-technologies>). No relevant BACT determination was found.

The draft LAER Part B, Section I and III Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_partb_draft_2-2-18.pdf?sfvrsn=6). No relevant BACT determination was found.

The draft document includes two BACT guidelines: 1.) the BACT guideline (prepared for App # 551284) discussed above, and 2.) the BACT guideline for another 1.6 MMBtu/hr snack food oven under App # 499293/551284.

The BACT guideline for App # 499293/551284 does not establish any VOC BACT standard.

Further, the draft Major Source, Part D Draft Proposals were also reviewed (http://www.aqmd.gov/docs/default-source/bact/proposed_updates_bact_guidelines_partd_draft_2-2-18.pdf?sfvrsn=6). There is a relevant draft BACT for ovens. The final version of this guideline is as follows (<http://www.aqmd.gov/docs/default-source/bact/bact-guidelines/bact-guidelines-2022/part-d---bact-guidelines-for-non-major-polluting-facilities.pdf?sfvrsn=8>):

**SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities***

2-2-2018 Rev. 0

Equipment or Process: **Food Oven**

Subcategory ¹	Rating/Size	Criteria Pollutants					Inorganic
		VOC	NOx	SOx	CO	PM10	
Ribbon Burner	> 500°F		60 ppmvd @ 3% O ₂ (2-2-2018)	Natural Gas (2-2-2018)	Compliance with applicable Rules 407 or 1153.1 (2-2-2018)	Natural Gas (2-2-2018)	
	≤ 500°F		30 ppmvd @ 3% O ₂ (2-2-2018)	Same as above	Same as above	Same as above	
Other Direct Fired Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Infrared Burner			30 ppmvd @ 3% O ₂ (2-2-2018)				
Add-on Control for Bakery Oven processing yeast leavened products with emissions ≥ 30 lb VOC/day		Catalytic oxidizer with 95% overall control efficiency (mass basis); catalyst inlet temperature ≥ 600°F; ceramic prefilter (2-2-2018)	Compliance with Rule 1147 at the time of applicability (2-2-2018)				

¹Indirect Fired units may be subject to Rules 1146 and 1146.1 and BACT for Process Heater.

Bay Area AQMD BACT clearinghouse

The BACT guidelines available on BAAQMD website were reviewed (<http://www.baaqmd.gov/permits/permitting-manuals/bact-tbact-workbook>).

No relevant BACT guideline was found.

Sacramento Metro AQMD BACT Clearinghouse

The BACT guidelines available on the AQMD website were reviewed ([http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-\(bact\)](http://www.airquality.org/businesses/permits-registration-programs/best-available-control-technology-(bact))). The following BACT guideline was found:

SMAQMD BACT CLEARINGHOUSE	
ACTIVE	
CATEGORY Type: OVEN	
BACT Category: Small Emitter BACT (PTE < 10 lb/day)	
BACT Determination Number: 292	BACT Determination Date: 8/17/2021
Equipment Information	
Permit Number: 28924	
Equipment Description: TORTILLA OVEN	
Unit Size/Rating/Capacity: Tortilla Oven ≤ 500 Deg. F	
Equipment Location: BERBER FOOD MANUFACTURING DBA MI RANCHO 10115 IRON ROCK WAY ELK GROVE, CA	
BACT Determination Information	
District Contact: Felix Trujillo Phone No.: (916) 874 - 7357 email: ftrujillo@airquality.org	
ROCs	Standard:
	Technology Description:
	Basis:
NOx	Standard: 30 ppmvd @ 3% O2
	Technology Description: Low NOx Burner
	Basis: Achieved in Practice
SOx	Standard: 500 ppmvd @ 3% O2
	Technology Description: Natural gas fuel or equivalent
	Basis: Achieved in Practice
PM10	Standard: Natural gas fuel or equivalent
	Technology Description: Natural gas fuel or equivalent
	Basis: Achieved in Practice
PM2.5	Standard:
	Technology Description:
	Basis:
CO	Standard: 400 ppmvd @ 3% O2
	Technology Description: Natural gas fuel or equivalent
	Basis: Achieved in Practice
LEAD	Standard:
	Technology Description:
	Basis:
Comments: T-BACT is equivalent to BACT for VOC.	

The guideline is available at:

<https://www.airquality.org/StationarySources/Documents/Tortilla%20Oven%20500%20F%20BACT%20292.pdf>

Note that this BACT guideline is for a direct-fired Tortilla Oven, and not the Tortilla Chip Oven. However, the emission standard and technologies appears to be transferrable to Tortilla Chip Ovens.

SJVAPCD BACT clearinghouse

The current requirements in District BACT guideline 1.6.4 for snack ovens are summarized in the following table:

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
VOC	Use of PUC quality natural gas fuel		

Oxidation Catalyst – Technologically Feasible Option

In general, an oxidation catalyst can be used to reduce CO or VOC. Oxidation catalyst must operate around 800°F to effectively reduce VOC or CO emissions.

Exhaust temperature of tortilla chip oven generally around 350-400°F. Therefore, this emission control cannot be used unless the process stream is heated to raise the temperature. This practice would result in an increase in collateral NOx, CO and other pollutants. Furthermore, none of the BACT guideline surveyed above recommend the use of this technology. Therefore, further evaluation of this add-on control technology is not recommended.

Survey of Federal, State and Local Rules and Regulations

The following rules and regulations were consulted to determine whether any limits apply to seasoner at commercial snack making operation to reduce PM10 emissions:

- New Source Performance Standard
- CARB (no applicable rules)
- South Coast AQMD Regulation XI Rules
- Bay Area AQMD Rules
- Sacramento Metro AQMD Rules
- San Joaquin Valley APCD Regulation IV Rules

Title 40, Chapter I, Subchapter C, Part 60 – Standards of Performance for New Stationary Sources

There is no subpart that is applicable to snack chip production facilities.

Therefore, no further discussion is required. Subparts are available at:

<https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-60?toc=1>

CARB (no applicable rules)

CARB's website includes rules from local air district related to stationary sources.

South Coast AQMD Regulation XI Rules

Rules in Regulation VII (<http://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book/regulation-xi>) are reviewed.

Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens (Last amended 11/7/2014)

The purpose of this rule is to reduce NO_x emissions from gaseous and liquid fuel-fired combustion equipment.

This rule applies to in-use ovens, dryers, smokers, and dry roaster with NO_x emissions from fuel combustion and are used to prepare food or products for making beverages for human consumption. This rule is not applicable to new units.

This rule does not list any standards for VOC emissions. As such, no further discussion is necessary.

Bay Area AQMD Rules

BAAQMD rules (<https://www.baaqmd.gov/rules-and-compliance/current-rules>) were reviewed.

Regulation 6 Rule 2 – Commercial Cooking Equipment (12/5/07) was reviewed (<https://www.baaqmd.gov/~media/dotgov/files/rules/reg-6-rule-2-commercial-cooking-equipment/documents/rg0602.pdf?la=en&rev=42fc0966398c43f9b585572708a5ea70>). No requirement was found for snack chip ovens.

Sacramento Metro AQMD Rules

The AQMD regulation 4 was reviewed (<https://www.airquality.org/Businesses/Rules-Regulations>).

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

The purpose of this rule is to reduce NO_x and CO emissions from gaseous and liquid fuel fired miscellaneous combustion units and cooking units.

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 NO_x 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 NO_x.

This rule does not list any standards for VOC emissions. As such, no further discussion is necessary.

San Joaquin Valley APCD Regulation IV Rules

Regulation IV (<https://www.valleyair.org/rules/1ruleslist.htm#reg4>) was reviewed.

Rule 4309 - Dryers, Dehydrators, and Ovens (12/15/05)

The purpose of this rule is to limit emissions of NOx and CO from dryers, dehydrators and ovens.

This rule applies to any dryer, dehydrator, or oven that is fired on gaseous fuel, liquid fuel or is fired on gaseous and liquid fuel sequentially, and the total heat input for the unit is 5.0 MMBtu/hr or greater.

Per section 4.1.4, the requirements of this rule are not applicable to units used to bake or fry food for human consumption.

Since the proposed oven is used to bake tortilla chip for human consumption, this unit is not subject to the requirements of this rule.

Survey of Source Tests For Snack Chip Ovens at Food Manufacturing Operations in the SJVAPCD:

Permits records were queried to identify snack chip ovens with active permits at snack chip manufacturing operations. Several units were identified (see **Appendix C** for complete list). These units are required to use PUC quality natural gas fuel. No units were tested for VOC emissions.

List of Control Options:

Based on the search of *BACT Clearinghouse Survey, Survey of Federal, State and Local Rules and Regulations and Survey of Source Tests For Snack Chip Ovens at Food Manufacturing Operations in the SJVAPCD*, discussed above, the following emission control options were developed:

Type of burner	Process Temperature	Achieved-in-Practice PM10 Standard	Technologically Feasible
Ribbon Burner	>500°F	Use of PUC quality natural gas (Source: SCAQMD, SJVAPCD)	None
	≤500°F	Use of PUC quality natural gas (Source; SCAQMD, SJVAPCD, SMAQMD)	None
Direct-fired/Infra-red burner		Use of PUC quality natural gas (Source: SCAQMD, SJVAPCD, SMAQMD)	

Step 2 - Eliminate Technologically Infeasible Options

There are no technologically infeasible options. As such, no further discussion is required.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

Pollutant	Achieved in Practice	Technologically feasible	Alternate Basic Equipment
VOC	Use of PUC quality natural gas fuel	None	None

Step 4 - Cost Effectiveness Analysis

There is no technologically feasible or alternate basic equipment listed in Step 3 above. Therefore, cost-effectiveness analysis is not required.

Step 5 - Select BACT

The BACT for the proposed tortilla chip oven is to use PUC quality natural gas fuel to reduce VOC emissions.

IV. Recommendation

Upon approval, the attached guideline is recommended to be adopted into District's BACT Clearinghouse.

Appendices

- A: Draft BACT Guideline
- B: Existing BACT Guideline 1.6.4
- C: Ovens in Permits Database

Appendix A
Draft BACT Guideline

**San Joaquin Valley
Unified Air Pollution Control District
Best Available Control Technology (BACT) Guideline 1.6.4***

Emissions Unit: Snack Chip Oven

Industry Type: Food Manufacturing

Equipment Rating: All

Last Update: June 21, 2023

Pollutant	Achieved-in-Practice or contained in SIP	Technologically Feasible	Alternate Basic Equipment
NOx	30 ppmvd @ 3% O ₂ (0.036 lb/MMBtu) with use of low-NOx burner system and using natural gas as primary fuel, or equivalent controls	Low temperature selective catalytic reduction (SCR) to achieve 2.5 ppmvd NOx @ 3% O ₂ (0.003 lb/MMBtu) and use of PUC quality natural gas fuel, or equivalent controls	
SOx	Use of PUC quality natural gas		
PM ₁₀	Use of PUC quality natural gas		
CO	400 ppmvd @ 3% O ₂ and use of PUC quality natural gas		
VOC	Use of PUC quality natural gas		

*BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

***This is a Summary Page for this Class of Source - Permit Specific BACT Determinations on Next Page(s)**

Appendix B
Existing BACT Guideline 1.6.4

Best Available Control Technology (BACT) Guideline 1.6.4 C

Emissions Unit:	Tortilla Chip Oven	Equipment Rating:	6.9 MMBtu/hr
Facility:	Recot, Inc	References:	ATC #: S-2076-13-4; -14-4 Project #: 990138
Location:	Bakersfield	Date of Determination:	6/16/1999

Pollutant	BACT
CO	Natural gas fuel
NOx	Natural gas fuel
PM10	BACT NOT TRIGGERED
SOx	BACT NOT TRIGGERED
VOC	BACT NOT TRIGGERED

BACT Status

Comment

Achieved in Practice

The following technologically feasible options were not cost effective

Selective Catalytic Reduction (NOX), Oxidation Catalyst (CO)

Appendix C
Ovens in Permits Database