San Joaquin Valley
Unified Air Pollution Control District
Best Performance Standard (BPS) x.x.xx

Class	*Ovens*
Category	*Conveyorized Tortilla Oven*
	Tortilla ovens meeting this Best Performance Standard must comply with all elements listed below: 1. The tortilla oven shall be equipped with a forced draft combustion air fan with air to fuel ratio control for the burner(s). 2. The oven stack shall be equipped with a system which provides continuous automatic control of the draft in the oven. A barometric damper meets this criteria. 3. Electric motors exceeding 10 horsepower which drive driving combustion air fans shall have an efficiency meeting the standards of the National Electrical Manufacturer's Association (NEMA) for "premium efficiency" motors.

Percentage Achieved GHG Emission Reduction Relative to Baseline Emissions	**10.6%**

District Project Number	C-1123204
Evaluating Engineer	Dennis Roberts, P.E.
Lead Engineer	Martin Keast
Public Notice of Intent Date	December 19, 2012
Public Notice: Start Date	January 28, 2013
Public Notice: End Date	March 1, 2013
Determination Effective Date	

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I. Best Performance Standard (BPS) Determination Introduction

A. Purpose

To assist permit applicants, project proponents, and interested parties in assessing and reducing the impacts of project specific greenhouse gas emissions (GHG) on global climate change from stationary source projects, the San Joaquin Valley Air Pollution Control District (District) has adopted the policy*: District Policy – Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency.* This policy applies to projects for which the District has discretionary approval authority over the project and the District serves as the lead agency for CEQA purposes. Nonetheless, land use agencies can refer to it as guidance for projects that include stationary sources of emissions. The policy relies on the use of performance based standards, otherwise known as Best Performance Standards (BPS) to assess significance of project specific greenhouse gas emissions on global climate change during the environmental review process, as required by CEQA. Use of BPS is a method of streamlining the CEQA process of determining significance and is not a required emission reduction measure. Projects implementing BPS would be determined to have a less than cumulatively significant impact. Otherwise, demonstration of a 29 percent reduction in GHG emissions, from business-as-usual, is required to determine that a project would have a less than cumulatively significant impact.

B. Definitions

Best Performance Standard for Stationary Source Projects is – a specific Class and Category, the most effective, District approved, Achieved-In-Practice means of reducing or limiting GHG emissions from a GHG emissions source, that is also economically feasible per the definition of achieved-in-practice. BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.

Business-as-Usual is - the emissions for a type of equipment or operation within an identified class and category projected for the year 2020, assuming no change in GHG emissions per unit of activity as established for the baseline period, 2002-2004. To relate BAU to an emissions generating activity, the District proposes to establish emission factors per unit of activity, for each class and category, using the 2002-2004 baseline period as the reference.

Category is - a District approved subdivision within a “class” as identified by unique operational or technical aspects.

Class is - the broadest District approved division of stationary GHG sources based on fundamental type of equipment or industrial classification of the source operation.

Determining Project Significance Using BPS

Use of BPS is a method of determining significance of project specific GHG emission impacts using established specifications. BPS is not a required mitigation of project related impacts. Use of BPS would streamline the significance determination process by pre-quantifying the emission reductions that would be achieved by a specific GHG emission reduction measure and pre-approving the use of such a measure to reduce project-related GHG emissions.

GHG emissions can be directly emitted from stationary sources of air pollution requiring operating permits from the District, or they may be emitted indirectly, as a result of increased electrical power usage, for instance. For traditional stationary source projects, BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.

II. Summary of BPS Determination Phases

The District has established ***Tortilla Chip Oven*** as a separate category of the clas "Ovens" which requires implementation of a Best Performance Standard (BPS) pursuant to the District's Climate Change Action Plan (CCAP). The District's determination of the BPS for this class and category has been made using the phased BPS development process established in the District's Final Staff Report, Addressing Greenhouse Gas Emissions under the California Environmental Quality Act. A summary of the specific implementation of the phased BPS development process for this specific determination is as follows:

Table 1
BPS Development Process Phases for *Conveyorized Tortilla Chip Oven*

Phase	Description	Date	Comments
1	Initial Public Process	12/18/12	The District's intent notice sent by email to interested parties registered on the District's GHG web site for this class and category is attached as Appendix C. Comment received during the initial public process with District's responses are attached a Appendix D.
2	BPS Development	N/A	See Section III of this evaluation document.
3	Public Participation: Public Notice Start Date	1/28/13	
4	Public Participation: Public Notice End Date	3/1/13	

III. Class and Category

Class: Steam Generator

Ovens has been established previously as a distinct class of equipment.:

Category: New Steam Generators Fired Exclusively with Natural Gas or LPG

Tortilla Chip Oven is recognized as a distinct category of oven based on the following:

- The class "Ovens" represents a wide variety of operations each of which is designed and operated with specific configurations to suit the particular product of the oven. Therefore, ovens designed for specific products are expected to require a specific BPS determination.
- Manufacturing of tortilla chips requires equipment specifically suited to meeting consumer tastes with respect to tortilla chips.

IV Public Notice of Intent

Prior to developing the development of BPS for this class, the District published a Notice of Intent. Public notification of the District's intent to develop BPS for this class was sent on December 19, 2012 to individuals registered with the CCAP list server. The District's notification is attached as Appendix A.

No comments were received during the initial public outreach.

V. BPS Development

STEP 1. Establish Baseline Emissions Factor for Class and Category

The Baseline Emission Factor (BEF) is defined as the three-year average (2002-2004) of GHG emissions for a particular class and category of equipment in the San Joaquin Valley (SJV), expressed as annual GHG emissions per unit of activity. The Baseline Emission Factor is calculated by first defining an operation which is representative of the average population of units of this type in the SJV during the Baseline Period and then determining the specific emissions per unit throughput for the representative unit.

A. Representative Baseline Operation

For *Tortilla Chip Oven*, the representative baseline operation has been determined to be a oven with the following attributes:

Rated firing capacity less than 10 MMBtu/hour
Forced draft combustion air with air/fuel ratio control
Stack equipped with a standard manual damper
Stack temperature 600 F with 16% O2
Standard efficiency, single speed motor for combustion air fan

This determination was based on:

- Review of ratings, source test results and associated operating conditions for units permitted in the District.:
- Assumption of conventional, single speed electric motor driver for the combustion air fan based on the observation that although premium efficiency motors with variable speed drives have been a relatively common specification for new facilities and retrofits in the last decade, commercial ovens have a useful life span of approximately 20 years and therefore it is expected that the oven fleet in place during the Baseline Period would not have included a significant population of units equipped with high efficiency drives.

B. Basis and Assumptions

- All direct GHG emissions are produced due to combustion of natural gas in this unit.
- For purposes of calculation, a tortilla chip production rate of 1 ton per hour is assumed.
- Stack temperature is 600 F and O2 content of the flue gas is 16 vol%.
- The following thermodynamic properties are applicable:

	Gas Phase Specific Heat Btu/lb-F	Heat of Evaporation Btu/lb at 68 F
Flue Gas	0.247	N/A
Air	0.247	N/A
Water	0.458	1,055

- Tortilla dough is assumed to contain 50% water. Tortilla product is assumed to exit the oven at 350 F and to have a specific heat of 0.25 Btu/lb-F.
- Convective and radiation losses are assumed to be 5% of the fired duty of the oven
- The F-Factor for natural gfas combustion is 8,570 scf/MMBtu. Assuming average molecular weight of 29.86, this is equivalent to:

8,570 scf/MMBtu x 29.86 lb-mol/379.5 scf/mol = 674.3 lb/MMBtu

- Excess air correction factor is 20.75%/(20.75-16.00%)
- GHG emissions are stated as "CO_2 equivalents" (CO_2(e)) which includes the global warming potential of methane and nitrous oxide emissions associated with gaseous fuel combustion.
- The GHG emission factor for natural gas combustion is 117 lb-CO_2(e)/MMBtu per CCAR document[1].
- Indirect emissions produced due to operation of the combustion air fan will be considered. Indirect emissions from other electric motors associated with the oven are not considered significant. .
- Static efficiency of the combustion air fan is assumed to be 60%.
- Flue gas side pressure drop for the burner + oven is assumed to be 20 inches water column.
- The combustion air fan is assumed to handle sufficient air to provide 10% excess air at the burner.
- Brake horsepower required for operation of the combustion air fan will be calculated by the following equation which is a simplified representation of adiabatic compression ignoring the compressibility of air as appropriate for the low pressure differentials typical for fans:

$$\text{Bhp(fan)} = \frac{\text{Air Flow, CFM}}{6{,}356} \times \frac{\text{Static Head, in. of water}}{\text{Static Efficiency}}$$

- Electric motor efficiency is estimated at 87% for a conventional electric motor.
- Indirect emissions from electric power consumption are calculated based on the draft District FYI "Quantifying Greenhouse Gas Emission Due to Electricity Use" which identifies an emission factor of 0.690 lb-CO_2e per kWh.

C. Unit of Activity

To relate Business-as-Usual to an emissions generating activity, it is necessary to establish an emission factor per unit of activity, for the established class and category, using the 2002-2004 baseline period as the reference.

The resulting emissions factor is the combination of:

GHG emission reductions achieved through technology, and

GHG emission reductions achieved through changes in activity efficiencies

[1] California Climate Change Action Registry (CCAR), Version 3.1, January, 2009 (Appendix C, Tables C.7 and C.8)

A unit of activity for this class and category will be taken as 2000 lbs of tortilla chip production
For purposes of this BPS determination, it will be assumed that GHG emissions reductions achieved through changes in activity efficiencies are not significant. This assumption has been made based on:

- A search of available literature did not yield any data which would support an estimate of GHG emission from ovens in this class and category since the baseline period based on changes in activity efficiencies.

D. Calculations

The Baseline Emission Factor (BEF) is the sum of the direct (GHG_D) and indirect (GHG_I) emissions (on a per unit of activity basis), stated as lb-CO_2 equivalent:

$BEF = GHG_D + GHG_I$

Direct Emissions:

$GHG_D = E_f \times SFC_B$

E_f = GHG emission factor = 117 lb- $CO_{2(e)}$/MMBtu of natural gas

SFC_B = Baseline Specific Fuel Consumption = MMBtu natural gas/ton chips

The SFC is calculated based on a heat balance on the oven. All heat flow quantities are listed in the following table:

Tortilla Oven Energy Balance:

Heat Inputs	
Fuel Firing Btu/hour	= SFC_B x 1,000,000
Heat Outputs	
Product Btu/hr	= 2,000 lb/hr x 0.25 Btu/lb-F x (350-68) F = 141,000
Water Vapor Enthalpy from Dough in Flue Gas Btu/hr	= 2,000 lb/hr x 0.458 Btu/lb-f x (600-68) F = 487,312
Flue Gas Enthalpy from Combustion Btu/hr	= 674.3 lb/MMBtu x SFC_B x 0.247 Btu/lb-F x (600-68) F
Excess air enthalpy in flue gas Btu/hr	= 674.3 lb/MMBtu x SFC_B x (1- (20.75%/(20.75%-16.00%))) x 0.247 Btu/lb-F x (600-68) F
Latent Heat of Moisture Btu/hr	= 2,000 lb/hr x 1,055 Btu/lb = 2,110,000
Radiative and convection Loss Btu/hr	= 5% x SFC x 1,000,000

Setting Heat Input = Heat Output and solving for the SFC yields:

SFC_B = 4.86 MMBtu per ton of tortilla chips

Direct emissions are then calculated as:

GHG_D = 117 lb-$CO_{2(e)}$/MMBtu x 4.86 MMBtu/ton chips
= 568.6 lb-CO2(e)/ton chips

<u>Indirect Emissions</u>

Indirect emissions produced from operation of the electric motor driving the combustion air fan are determined by the following:

GHG (electric motor) = Electric Utility GHG Emission Factor x kWh consumed

To determine kWh consumption per ton of chips produced it is necessary to first determine the Bhp requirement for the gas compression operation by the combustion air blower. It is assumed that the fan must provide the stoichiometric air for combustion plus sufficient excess air to provide 3% O2:

Combustion Air Fan

$$\text{Combustion Air Rate} = 4.86\ \text{MMBtu/hr} \times 8578\ \text{scf/MMBtu} \times \frac{20.75\%}{20.75\% - 3.00\%} \times \frac{1\ \text{hour}}{60\ \text{minutes}}$$

$$\text{Combustion Air Rate} = 812\ \text{cfm}$$

$$\text{Bhp} = \frac{812\ \text{CFM} \times 20"\ \text{W.C.}}{6{,}356 \times 60\%}$$

$$\text{Bhp} = 4.2$$

Bhp is then converted to a brake kWh per ton chips:

Brake kWh: = (4.2) x 0.7457 kWh/bhp = 3.1 kWh/ton chips

Actual kWh consumption is calculated based on motor efficiency:

kWh consumption = 3.1 brake kWh/ton ÷ 85% = 3.6 kWh/ton

GHG (electric motor) = 0.69 lb-CO_2e/kWh x 3.6 kWh/ton

GHG (electric motor) = 2.5 lb-CO_2e/ton

The Baseline Emission Factor is the sum of the direct and the indirect emissions:

BEF = *568.6 + 2.5 = 571 lb-* CO_2(e)*/ton tortilla chips*

STEP 2. Technologically Feasible GHG Emission Control Measures

A. Analysis of Potential Control Measures

The following findings and/or considerations are applicable to this class and category:

Use of Economizers

An economizer can be used to recover heat from the stack and deliver it to other energy users in the facility such as water heating, cooking or drying operations, space heating, etc. However, this use is dependent upon the presence of other energy receptors in the facility.

Air Pre-heaters

An air preheater can be used to recover heat from the stack and preheat the combustion air to the oven, reducing fuel use by the burner. Pre-heating combustion air generally causes an increase in NOx emissions in the absence of other NOx control devices such as selective catalytic reduction. Since use of an SCR is not recognized as Achieved-in-Practice BACT for control of NOx emissions from tortilla ovens, the use of air preheaters for tortilla chip ovens is determined to not be technologically feasible for use in the SJVAPCD.

Forced draft combustion air fan with air to fuel ratio control for the burner(s)

Conveyorized tortilla ovens with this feature operate with a balanced draft system. The burner operation is forced draft (which allows efficient control of the air/fuel ratio for combustion) while the oven itself operates with negative gauge pressure due to the draft produced by the stack. Therefore, the excess air at the stack is a mixture of the excess combustion air supplied at the burner plus the air drawn into the oven by the stack draft. Forced draft burner operation with ratio control reduces fuel consumption by ensuring that only the amount of excess air as required to support efficient and safe combustion is admitted at the burner.

Continuous automatic control of the oven draft

Control of the oven draft at the minimum required for efficient and safe operation reduces the fuel use by further reducing the excess air in the stack. This can be achieved by installation of a pressure sensor on the oven which provides a control setpoint to an automated damper installed in the stack or by use of a barometric damper which automatically admits cold atmosheric air into the stack to maintain the stack draft at a pre-determined setpoint. Although this effect could be achieved by regular adjustment of a manual stack damper, in practice the damper is typically set at a conservative point which ensures that the stack operates with ample draft over the entire range of operating conditions for the oven with the result that the oven, on average, operates with substantially more excess air than the minimum required.

Use of premium efficiency motor for combustion air fan

An electric motor efficiency standard is published by the National Electrical Manufacturers Association (NEMA) which is identified as the "NEMA Premium Efficiency Electric Motors Program". For large motors, the NEMA premium efficiency motor provides a gain of approximately 5-8 percentage points in motor efficiency when compared to a standard efficiency motor. The NEMA specification covers motors up to 500 horsepower and motors meeting this specification are in common use and are available from most major electric motor manufacturers.

Use of speed control for combustion air fan

Control of the combustion air fan operation by use of a variable speed electric motor will provide substantial energy savings when compared to operation at a fixed speed and controlled by throttling the discharge flow. The most common and economical variable speed drive is the variable frequency drive (VFD) which has become commonly available in the last decade and is typical for new boiler fan applications. The VFD provides energy savings when the fan is operated at substantial turndown ratios which can result in throttling away more than half the rated energy output of the motor.

Use of High Efficiency Combustion Air Fans

The peak efficiency of centrifugal fans may vary from 60 to 80% depending upon fan design and application. Use of a higher efficiency fan provides either savings in indirect GHG emissions due to the significant reduction in electric motor horsepower for motor-driven fans or savings in direct GHG emissions when the fan is driven by a steam turbine. However, the absolute value of efficiency which can be achieved is highly dependent upon the specific operating conditions including flow, pressure, and temperature, all of which may vary significantly for any specific boiler. Given this variability as well as the absence of any effective industry standard for fan efficiency, the District's opinion is that specification of combustion air fan efficiency cannot be realistically included as a technologically feasible reduction measure in the BPS for boilers at this time.

B. Listing of Technologically Feasible Control Measures

For the specific equipment or operation being proposed, all technologically feasible GHG emissions reduction measures are listed, including equipment selection, design elements and best management practices, that do not result in an increase in criteria pollutant emissions compared to the proposed equipment or operation.

Table 2
Technologically Feasible GHG Reduction Measures for *Coneyorized Tortilla Chip Ovens*

Reduction Measure	Qualifications
1. Use of an economizer to recover useful heat from the oven stack	*Recovery of useful heat from the stack for use in other applications results in GHG reduction by offsetting other fuel use in the facility. Requires that the facility have other appropriate receptors for the stack heat.*
2. Forced draft combustion air fan with air to fuel ratio control for the burner(s)	*Reduces GHG emissions by reducing excess air for the combustion process resulting in increased fuel efficiency*
3. Continuous automatic control of the oven draft	*Reduces GHG emissions by continuously controlling the oven draft at the optimum value, reducing excess air in the stack, leading to increased fuel efficiency*
4. Use of premium efficiency motor for combustion air fan	*Use of premium efficiency motors reduces electric power consumption by the combustion air fan, resulting in reduced indirect GHG emissions at the electric utility plant.*
5. Use of speed control for combustion air fan	*Use of a speed-controlled motor reduces electric power consumption by the combustion air fan when the fan is operating at less than rated capacity, resulting in reduced indirect GHG emissions at the electric utility plant.*

All technologically feasible GHG reduction measures listed in Table 2 above meet the following criteria:

<u>All technology listed is in current commercial use.</u>

All technologically feasible GHG reduction measures listed in Table above are based on technology (condensing economizers, high efficiency motors with variable speed drives) which is currently in commercial use. This technology has been in place for a significant number of years and was developed and implemented without benefit of grants, incentives or other financial subsidies.

Implementation of all listed technology does not result in an increase in criteria pollutant emissions.

In general, since all proposed measures do not affect the criteria pollutant emission factors and generally result in a reduction in the firing of fuel, criteria pollutant emissions will generally be reduced with implementation of the reduction measures.

STEP 3. Identify all Achieved-in-Practice GHG Emission Control Measures

For all technologically feasible GHG emission reduction measures, all GHG reduction measures determined to be Achieved-in-Practice are identified. Achieved-in-Practice is defined as any equipment, technology, practice or operation available in the United States that has been installed and operated or used at a commercial or stationary source site for a reasonable period of time sufficient to demonstrate that the equipment, the technology, the practice or the operation is reliable when operated in a manner that is typical for the process. In determining whether equipment, technology, practice or operation is Achieved-in-Practice, the District will consider the extent to which grants, incentives or other financial subsidies influence the economic feasibility of its use.

The following findings or considerations are applicable to this class and category:

The District reviewed commercial offerings of tortilla oven manufacturers as well as available literature concerning energy efficiency programs in existing tortilla chip manufacturing facilities in the United States. The review indicated the following with respect this class and category:

- Forced draft combustion systems with air/fuel ratio control combined with a barometric damper on the stackn for draft control is a common commercial offering of tortilla chip oven manufacturers and the combination is thus Achieved-in-Practice.
- Economizers have been installed on tortilla chip ovens in large commercial operations with both vertically and horizontally integrated manufacturing of a wide variety of snack foods. The resulting heat recovery operations delivers heat to other various manufacturing processes. Since the operation relies on the presence of other site specific operations which are not necessarily a part of the tortilla manufacturing operation, heat recovery using an economizer is not sufficiently general in scope to be considered Achieved-in-Practice.

- NEMA Premium Efficiency electric motors are in general industrial use, however, the District did not find any specific applications for conveyorized ovens. Based on widepread industrial use in larger motor sizes, the District will consider NEMA Premium Efficiency motors to be achieved-in-Practice for combustion air fan motors exceeding 10 horsepower.

- The use of variable speed drives for electric motors serving combustion air fans are in general industrial use, particularly in steam boilers and similar equipment. However, the potential efficiency improvement which can be achieved with such equipment is highly dependent upon the degree to which the equipment is operated in a turndown condition relative to the rated capacity of the unit. For boilers, which typically provide utility steam to other processes with a widely varying demand, the operational time at turndown is significant, easily justifying a variable speed drive for the fan. In the case of a conveyorized tortilla chip oven, the unit is typically (and most efficiently) operated at full capacity until the desired production quoate is achieved, at which time the unit is shutdown. Based on this, one would not expect to find variable speed motor drives in this application. Additionally, the District has not discovered any specific application of variable speed drive for combustion air fans on tortilla chip ovens. Based on this, variable speed drive motors are not considered Achieved-in-Practice for combustion air fans on tortilla chip ovens..

Based on the above, all Achieved-in-Practice reduction measures are presented in the following table:

Table 3
Achieved-in-Practice GHG Reduction Measures for *Conveyorized Tortilla Chip Ovens*

Reduction Measure	Qualifications
1. Forced draft combustion air fan with air to fuel ratio control for the burner(s)	*Common industrial practice and common commercial offering by tortilla chip oven manufacturers*
2. Continuous automatic control of the oven draft	*Common industrial practice and common commercial offering by tortilla chip oven manufacturers*
3. Use of premium efficiency motor for combustion air fan exceeding 10 hp	*Common industrial practice for large motors*

STEP 4. Quantify the Potential GHG Emission and Percent Reduction for Each Identified Achieved-in-Practice GHG Emission Reduction Measure

For each Achieved-in-Practice GHG emission reduction measure identified:

a. Quantify the potential GHG emissions per unit of activity (G_a)
b. Express the potential GHG emission reduction as a percent (G_p) of Baseline GHG emissions factor per unit of activity (BEF)

All Achieved-in-Practice reduction measures are independently implemented and are thus additive in impact. Therefore, the GHG emission quantification will be presented as a single value based on the additive contribution of each individual measure incorporated into the overall control measure.

A. Basis and Assumptions:

Consistent with the approach taken for quantification of the Baseline Emission Factor, a tortilla chip oven with a rating less than 10 MMBtu/hour will be assumed to represent the average new unit to be proposed in this class and category. Based on this, the combustion air fan motor is expected to be less than 10 horsepower and therefore a NEMA Premium Efficiency motor will not be considered to be required for the typicaly new unit.

- The unit is equipped with a barometric damper and a forced-draft combustion system with air/fuel ratio control
- The stack is assumed to have a draft capability of at least 10% over that required for operation of the oven. This value, along with the observation that a manual damper will generally be permanently set at a conservatively high draft value, results in a reasonable assumption that use of the barometric damper will result in operation an optimum oven draft which is 10% less than the Baseline Case.
- Since the admission of air into the oven is a turbulent flow phenomena which is proportional to the square of the pressure didderentil between the oven and the atmosphere, operation at a draft which is 10% less than the Baseline Case results in a reduction of excess air (EA) of:

$$EA_2 = (\Delta P_2^2/\Delta P_1^2)^2 \text{ x } EA_1 = (0.9 \text{ x } \Delta P_1^2/\Delta P_1^2)^2 \text{ x } EA_1 = 81\% \text{ x } EA_1$$

- Using the equation for the air flow correction factor = 20.75%(20.75$-O2%), it can be demonstrated that reducing the excess air to 81% of that required to achieve an O2 concentration of 16% would result in an O2 concentration of 14.89% in the stack. Therefore, the BPS case id assumed to operate with an excess air concentration of 14.89% in the stack.
- It is assumed that a stack temperature of 600 F (same as the Baseline Case) is still required upstream of the barometric damper in order to achieve the same baking performance (stack temperature downstream will be reduced due to the admission of ambient air to control the draft).
- All other assumptions and basis are the same as the baseline case.

B. Calculation of Potential GHG Emissions per Unit of Activity (G_a):

G_a is the sum of the direct (GHG_D) and indirect (GHG_I) emissions (per unit of activity):

$G_a = GHG_D + GHG_I$

<u>Direct Emissions:</u>

$GHG_D = E_f \times SFC$

E_f = GHG emission factor = 117 lb- $CO_{2(e)}$/MMBtu of natural gas

SFC_{BPS} = Specific Fuel Consumption = MMBtu natural gas/ton tortilla chips for the BPS case

The SFC_{BPS} is calculated based on a heat balance on the oven. All heat flow quantities are listed in thefollowing table:

Heat Inputs	
Fuel Firing Btu/hour	= SFC_{BPS} x 1,000,000
Heat Outputs	
Product Btu/hr	= 2,000 lb/hr x 0.25 Btu/lb-F x (350-68) F = 141,000
Water Vapor Enthalpy from Dough in Flue Gas Btu/hr	= 2,000 lb/hr x 0.458 Btu/lb-f x (600-68) F = 487,312
Flue Gas Enthalpy from Combustion Btu/hr	= 674.3 lb/MMBtu x SFC_{BPS} x 0.247 Btu/lb-F x (600-68) F
Excess air enthalpy in flue gas Btu/hr	= 674.3 lb/MMBtu x SFC_{BPS} x (1- (20.75%/(20.75%-14.89%))) x 0.247 Btu/lb-F x (600-68) F
Latent Heat of Moisture Btu/hr	= 2,000 lb/hr x 1,055 Btu/lb = 2,110,000
Radiative and convection Loss Btu/hr	= 5% x SFC x 1,000,000 = 243,000 Btu/hr (assumed same as Baseline Case)

Setting Heat Input = Heat Output and solving for the SFCa yields:

SFC_{BPS} = 4.34 MMBtu per ton of tortilla chips

Direct emissions are then calculated as:

GHG_D = 117 lb-$CO_{2(e)}$/MMBtu x 4.34 MMBtu/ton chips
= 507.8 lb-CO2(e)/ton chips

Indirect Emissions

Indirect emissions produced from operation of the electric motor driving the combustion air fan are determined by the following:

GHG (electric motor) = Electric Utility GHG Emission Factor x kWh consumed

To determine kWh consumption per ton of chips produced it is necessary to first determine the Bhp requirement for the gas compression operation by the combustion air blower. It is assumed that the fan must provide the stoichiometric air for combustion plus sufficient excess air to provide 3% O2:

Combustion Air Fan

$$\text{Combustion Air Rate} = 4.34\ \text{MMBtu/hr} \times 8578\ \text{scf/MMBtu} \times \frac{20.75\%}{20.75\% - 3.00\%} \times \frac{1\ \text{hour}}{60\ \text{minutes}}$$

$$\text{Combustion Air Rate} = 725\ \text{cfm}$$

$$\text{Bhp} = \frac{725\ \text{CFM} \times 20\text{" W.C.}}{6{,}356 \times 60\%}$$

$$\text{Bhp} = 3.8$$

Bhp is then converted to a brake kWh per ton chips:

Brake kWh: = (3.8) x 0.7457 kWh/bhp = 2.8 kWh/ton chips

Actual kWh consumption is calculated based on motor efficiency:

kWh consumption = 2.8 brake kWh/ton ÷ 85% = 3.2 kWh/ton

GHG (electric motor) = 0.69 lb-CO_2e/kWh x 2.8 kWh/ton

GHG (electric motor) = 1.9 lb-CO_2e/ton

The G_a Emission Factor is the sum of the direct and the indirect emissions:

G_a = *507.8 + 1.9 = 510 lb-* CO_2(e)*/ton tortilla chips*

C. Calculation of Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p):

G_p = (BEF - G_a) / BEF = (571 – 510)/571 = 10.6%

STEP 5. Rank all Achieved-in-Practice GHG emission reduction measures by order of % GHG emissions reduction

Since only a single achieved in practice control measure is identified, no ranking is necessary.

STEP 6. Establish the Best Performance Standard (BPS) for this Class and Category

For Stationary Source Projects for which the District must issue permits, Best Performance Standard is – "For a specific Class and Category, the most effective, District approved, Achieved-In-Practice means of reducing or limiting GHG emissions from a GHG emissions source, that is also economically feasible per the definition of achieved-in-practice. BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category".

Based on the definition above, Best Performance Standard (BPS) for this class and category is determined as:

<u>Best Performance Standard for Conveyorized Tortilla Chip Ovens</u>

Tortilla ovens meeting this Best Performance Standard must comply with all elements listed below:

1. ***The tortilla oven shall be equipped with a forced draft combustion air fan with air to fuel ratio control for the burner(s).***
2. ***The oven stack shall be equipped with a system which provides continuous automatic control of the draft in the oven. A barometric damper meets this criteria.***
3. ***Electric motors exceeding 10 horsepower which drive driving combustion air fans shall have an efficiency meeting the standards of the National Electrical Manufacturer's Association (NEMA) for "premium efficiency" motors.***

STEP 7. Eliminate All Other Achieved-in-Practice Options from Consideration as Best Performance Standard

The following Achieved-in-Practice GHG control measures, identified in Step 4 and ranked in Step 5 are specifically eliminated from consideration as Best Performance Standard since they have GHG control efficiencies which are less than that of the selected Best Performance Standard as stated in Step 6:

No other Achieved-in-Practice options were identified.

VII. Appendices

Appendix A: Public Notice of Intent

Appendix A
Public Notice of Intent

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING

NOTICE OF DEVELOPMENT of

Best Performance Standards

NOTICE IS HEREBY GIVEN that the San Joaquin Valley Air Pollution Control District solicits public comment on development of Best Performance Standards for the following Stationary Source class and category of greenhouse gas emissions:

Tortilla Chip Ovens

The District is soliciting public input on the following topics for the subject Class and Category of greenhouse gas emission source:

- Recommendations regarding the scope of the proposed Class and Category,
- Recommendations regarding processes or operational activities the District should consider when establishing Baseline Emissions for the subject Class and Category. In this regard, the District seeks to develop an estimate of the average fleet thermal efficiency of units in this class and category operating in the District in during 2002-2004 and,
- Recommendations regarding technologies to be evaluated by the District, when establishing Best Performance Standards (best Achieved-in-Practice GHG emission control) for the subject Class and Category. Based on a preliminary screening, the District is currently considering the following GHG emission control specifications:
  - Heat recovery from the stack
  - Forced draft design
  - High efficiency motors with VFD for combustion air fans

Information regarding development of the proposed Best Performance Standard can be obtained from the District's website at http://www.valleyair.org/Programs/CCAP/bps/BPS_idx.htm

Written comments regarding the proposed Best Performance Standard should be addressed to Dennis Roberts by email, dennis.roberts@valleyair.org, or by mail at SJVUAPCD, 1990 East Gettysburg Ave., Fresno, CA 93726 and must be received by January 25, 2013. For additional information, please contact Dennis Roberts at dennis.roberts@valleyair.org or by phone at (559) 230-5919.

Information regarding the District's Climate Action Plan and how to address GHG emissions impacts under CEQA, can be obtained from the District's website by clicking on http://www.valleyair.org/Programs/CCAP/CCAP_idx.htm.

December 19, 2012