March 4, 2010
Mr. Sajjad Ahmad
San Joaquin Valley Unified Air Pollution Control District
1990 East Gettysburg Avenue
Fresno, CA 93726

Mr. Ahmad:

Vapor Systems Technologies respectfully submits the following comments to the Best Performance Standard Project #C-1095109. Please see the attached revised document with corrections to some content.

VST Comments:

1. Pg. 4 III. Step 1. A. Representative Baseline Operation – Current CARB data shows that the penetration of assist systems statewide is approximately 70%, with the rest of the GDFs having balance systems – this is of course statewide not San Joaquin Valley but should a baseline be established with data from 2002-2004 or with more current data?
2. For the calculations for the GHG Emissions – VST would propose considering:
    a. GHG associated with producing vapor pumps
    b. GHG associated with installing and maintaining the equipment—in addition to the capital cost there is a replacement cost including equipment, labor, travel, disposal of the equipment etc
    c. Regulatory compliance cost – reduction of over pressurization caused by active systems versus passive. VST has two test sites in operation that have demonstrated zero regulation issues as well as zero downtime.

Vapor Systems Technologies, Inc.
650 Pleasant Valley Drive • Springboro, Ohio 45066
937-704-9333 • Fax 937-704-9443
www.vsthose.com

Corrections to Content:

3. Pg. 6 Table 2 #4 is incorrect in the Phase II Vapor Recovery System - it should read VST instead of EMCO Wheaton for VR-209
4. Pg. 8 Table 4 #2 is incorrect in the Control Measure – it should read VST with Healy Clean Air Separator for VR-209
5. Appendix 6 – #1 pg. 2 in the sentence – "Therefore, the total GHG from Phase II vapor recovery system with Hirt Burner are:" It should read "…with Clean Air Separator…"
6. Appendix 6 - #2 pg 2 in the sentence - "Therefore, the total GHG from Phase II vapor recovery system with Hirt Burner are:" It should read "…with VST Membrane Processor…"
7. Appendix 6 - #2 pg 3 in the sentence - "Total GHG from Healy (VR-201, VR-202)" It should read "…from VST (VR-203, VR-204)…"
8. Appendix 6 - #4 pg. 3 the title reads – "EMCO Wheaton with Healy Clean Air Separator" – it should read "VST with Healy Clean Air Separator"

Please let us know if you have any questions or concerns regarding the information we have provided.

Sincerely,

Glenn K. Walker
President, Vapor Systems Technologies, Inc.

Vapor Systems Technologies, Inc.
650 Pleasant Valley Drive • Springboro, Ohio 45066
937-704-9333 • Fax 937-704-9443
www.vsthose.com

San Joaquin Valley
Unified Air Pollution Control District

Best Performance Standard (BPS) x.x.xx

Date: 2/08/2010

Class and Category	Gasoline Dispensing Facilities (GDFs) with underground gasoline storage tanks and subject to ARB's EVR requirements
Best Performance Standard	
Percentage Achieved GHG Emission Reduction Relative to Baseline Emissions	

District Project Number	C-1095109
Evaluating Engineer	Sajjad Ahmad
Lead Engineer	Sheraz Gill
Initial Public Notice Date	
Final Public Notice Date	
Determination Effective Date	

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 polic*y: 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.

C. 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 Gasoline Dispensing Facilities (GDFs) with underground gasoline storage tanks and subject to ARB's Enhanced Vapor Recovery (EVR) requirements as a separate class and category 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 Gasoline Dispensing Facilities (GDFs) with underground gasoline storage tanks and subject to ARB's EVR requirements

Phase	Description	Date	Comments
1	Initial Public Process	xx/xx/xx	The District's intent notice and a list of individuals receiving notification are attached as Appendix 1.
2	BPS Development	N/A	See Section III of this evaluation document.
3	Public Review	xx/xx/xx	The District's BPS determination notice and a list of individuals receiving notification are attached as Appendix 2.

4	Public Comments	xx/xx/xx	The public comment period ended on the date given. All public comments received and the District's responses are attached as Appendix 3.
5	Public Workshop	xx/xx/xx	All comments received during the workshop and the District's responses are also included in Appendix 3.
6	Finalization	xx/xx/xx	The BPS established in this evaluation document is effective on the date of finalization.

III. 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 GDFs with underground gasoline storage tank and subject to ARB's Enhanced Vapor Recovery (EVR) requirements, the representative baseline operation has been determined to be 70% of GDFs equipped with balance Phase II vapor recovery systems (predominately G-70-52-AM), 20% equipped with a vacuum assist system without a burner (with no combustion emissions) and 10% equipped with a vacuum assist system with a burner (with combustion emissions). This determination is based on a review of the District's permit data base which indicates that this was the most common configuration permitted by the District during the baseline period of 2002-2004.

B. Basis and Assumptions

All applicable basis and assumptions are stated in calculations in Appendix 4.

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.

Based on initial public review process, the unit of activity for this class and category has been established as pounds of CO_2 per thousand gallons of gasoline dispensed (lb-CO_2/1,000 gallon).

C. Calculations

Baseline Emission Factor (BEF) for this class and category is calculated as follows (see Appendix 4 for detailed calculations):

BEF = 0.059 lb-CO_2/1,000 gallons

STEP 2. List Technologically Feasible GHG Emission 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. The following findings or considerations are applicable to this class and category:

- The emissions unit must be equipped with ARB-certified Phase I and Phase II vapor recovery systems to comply with ARB's Enhanced Vapor Recovery (EVR) requirements for GDFs with underground gasoline storage tanks.

Currently ARB has certified two types of Phase II EVR vapor recovery systems:

1. Phase II Vapor Recovery Systems with Hirt VCS 100 Burner: These systems involve with combustion emissions from Hirt burner. Currently there are three such ARB certified systems: VR-205, VR-207 and VR-208. They involve both direct GHG due to combustion and indirect GHG due to electric usage of various system components (see Appendix 4 for calculations of GHG).
2. Phase II Vapor Recovery Systems without Burner: These systems do not involve combustion emissions. Currently there are five such ARB certified systems: VR-201, VR-202, VR-203, VR-204, and VR-209. They involve only indirect GHG due to electric usage of various system components (see Appendix 5 for calculations of GHG).

The following table summarizes all technologically feasible GHG emissions reduction measures that are applicable to this class and category:

Table 2
Technologically Feasible GHG Reduction Measures

#	ARB Executive Order Number	Phase II Vapor Recovery System	Most Prominent System Component	System Type
1	VR-201, VR-202	Healy	Healy Clean Air Separator	Vacuum Assist
2	VR-203, VR-204	VST	VST Membrane Processor	
3	VR-203, VR-204	VST	Veeder-Root Vapor Polisher	Balance
4	VR-209	**VST**	Healy Clean Air Separator	

Based on a review of available technology and with consideration of input from industry, manufacturers and other members of the public, the following is determined to be the technologically feasible GHG emission reduction measures for this class and category:

Table 3
Technologically Feasible GHG Control Measures for GDFs with Underground Gasoline Storage Tanks

Control Measure	Qualifications
ARB-certified, non-combustion Phase II vapor recovery system with high-efficiency electric motor (motor efficiency no less than 90%) and blower (overall blower static efficiency no less than 65%)	Specification of high efficiency blower equipment reduces indirect GHG emissions by reducing electric energy consumption
ARB-certified, combustion-based Phase II vapor recovery systems with high-efficiency electric motor (motor efficiency no less than 90%) and blower (overall blower static efficiency no less than 65%)	These systems have no control over direct GHG emissions. However, specification of high efficiency blower equipment reduces indirect GHG emissions by reducing electric energy consumption

All of the control measures identified above are equipped with control equipment for criteria pollutants which meets current regulatory requirements and criteria for Best Available Control Technology. None of the identified control measures would result in an increase in emissions of criteria pollutants.

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:

- GDFs with ARB-certified non-combustion Phase II EVR vapor recovery systems have been demonstrated commercially available and are thus Achieved-in-Practice

- GDFs with ARB-certified combustion-based Phase II EVR vapor recovery systems have been demonstrated commercially available and thus are Achieved-in-Practice

Based on a review of available technology and with consideration of input from industry, manufacturers and other members of the public, the following is determined to be the Achieved-in-Practice GHG emission reduction measures for this class and category:

- ARB-certified, non-combustion Phase II vapor recovery systems with high-efficiency electric motor (motor efficiency no less than 90%) and blower (overall blower static efficiency no less than 65%)

- ARB-certified, combustion-based Phase II vapor recovery systems

All of the control measures identified above are equipped with control equipment for criteria pollutants which meets current regulatory requirements and criteria for Best Available Control Technology. None of the identified control measures would result in an increase in emissions of criteria pollutants

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

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

a. Quantify the potential GHG emission reduction, as compared to the Baseline GHG emissions factor 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)

Please see Appendix 4 and 5 for detailed calculations of both direct and indirect GHG from each of the currently ARB certified Phase II EVR vapor recovery systems.

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

Based on the calculations presented in Appendices I and II, the Achieved-in Practice GHG emission reduction measures are ranked in the table 3 below:

Table 4
Ranking of Achieved-in-Practice GHG Emission Control Measures

Rank	Control Measure	Potential GHG Emission Reduction per Unit of Activity (G_a) lb-CO2/1,000 gallons	Potential GHG Emission Reduction as a Percentage of the Baseline Emission Factor (G_p)
1	VST with Veeder-Root Vapor Polisher (VR-203 or VR-204)	0	0
2	VST with Healy Clean Air Separator (VR-209)	0	0
3	VST with VST Membrane Processor (VR-203 or VR-204)	0.120	203 %
4	Healy with Healy Clean Air Separator (VR-201 or VR-202)	0.163	276 %
5	VST/Emco Wheaton with Hirt VCS 100 Burner (VR-205, VR-207 or VR-208)	0.349	592 %

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 and the ranking given in Table 3 from Section II.5, Best Performance Standard (BPS) for this class and category is determined as:

Best Performance Standard for GDFs with Underground Gasoline Storage Tanks Subject to ARB's EVR Requirements

Best Performance Standard for GDFs with Underground Gasoline Storage Tanks

ARB-approved, non-combustion Phase II vapor recovery systems with high-efficiency electric motor (motor efficiency no less than 90%) and blower (overall blower static efficiency no less than 65%)

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 Section II.4 and ranked in Table 3 of Section II.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 Section II.6:

Eliminated Achieved-in-Practice Control Measures for GDFs with Underground Tanks

ARB-approved, combustion-based Phase II vapor recovery systems

III. Appendices

Appendix 1	Initial Public Process
Appendix 2	Public Review Process
Appendix 3	Public Comments Received and District Responses
Appendix 4	Calculations for Baseline Emissions Factor (BEF).
Appendix 5	Calculations for GHG Emissions from Hirt Burner.
Appendix 6	Calculations for GHG Emissions from Technologically Feasible Options.

APPENDIX 1

Initial Public Process

APPENDIX 2

Public Review Process

APPENDIX 3

Public Comments Received and District Responses

APPENDIX 4

Calculations for Baseline Emissions Factor (BEF)

Calculations for Baseline Emissions Factor (BEF)

As discussed in Section III.1.A of this document, there were three GDF classes during the baseline period of 2002-2004. Baseline emission factor for GHG is calculated below for each GDF class and then combined to give an overall baseline emission factor (BEF):

a) 70% GDF equipped with a balance Phase II vapor recovery system:

Assumptions

- Direct GHG emissions are zero since methane emissions from gasoline tanks are negligible and there are no combustion processes involved.
- Indirect GHG emissions are zero since balance systems do not use any electric motor-driven vacuum blower to draw vapors.

Calculations

The Baseline Emission Factor for this class is $\mathbf{BEF_a = 0}$

b) 20% GDF equipped with a vacuum assist Phase II vapor recovery system WITHOUT a burner:

Assumptions

- Direct GHG emissions are zero since methane emissions from gasoline tanks are negligible and there are no combustion processes involved.
- Indirect emissions are produced due to operation of a ½ hp electric motor-driven vacuum pump associated with the Phase II vapor recovery system.
- The vacuum pump is estimated to operate 8 hours per day .
- Indirect emissions from electric power consumptions are calculated based on the current PG&E electric power generation factor of 0.524 lb-CO2 per kWh
- Electric motor efficiency is 90%

Calculations

Specific electricity consumption for the blower is:

0.5 hp x 8 hours/day x 0.7457 kW/hp x (1/90%) = 3.31 kWh/day

GHG Emissions are:

3.31 kWh/day x 0.524 lb-CO2/kWh x 365 day/year = 633 lb-CO2/year

The Baseline Emission Factor is therefore,

BEF_b = 633 lb-CO2/year

c) 10% GDF equipped with a vacuum assist Phase II vapor recovery system WITH a burner:

Assumptions

- Direct GHG emissions consist of CO_2 and CO emissions from combustion of gasoline vapors in the burner.
- Maximum CO_2 and CO emissions from combustion of gasoline vapors in the Hirt burner are 14.9 lb/hr and 0.0036 lb/hr, respectively (ARB determination – although this determination was for EVR Hirt VCS 100 burner, it will be used for all pre-EVR burners since data is not readily available for these burners at this time).
- The burners maximum run time is 1,197 sec/day (ARB determination)
- Indirect emissions are produced due to operation of a ½ hp electric motor-driven vacuum blower associated with the Phase II vapor recovery system.
- The vacuum blower is estimated to operate 20 minutes per day.
- Indirect emissions from electric power consumptions are calculated based on the current PG&E electric power generation factor of 0.524 lb-CO2 per kWh
- Electric motor efficiency is 90%

Calculations

Direct GHG emissions are:

CO_2 emissions = 14.9 lb/hr x 1 hr/3,600 sec x 1,197 sec/day x 365 days/year = 1,808 lb-CO_2/year

CO emissions = 0.0036 lb/hr x 1 hr/3,600 sec x 1,197 sec/day x 365 days/year = 0.44 lb-CO/year

To convert CO emissions in terms of CO_2 emissions, the following chemical reaction is used:

$CO + ½ O_2$ ------------→ CO_2
Thus one lb-mole of CO will generates one lb-mole of CO_2. Therefore,

(lb-CO_2/year)/Mol Wt of CO_2 = (lb-CO/year)/Mol Wt of CO
or
lb-CO_2/year = (lb-CO/year)/Mol Wt of CO x Mol Wt of CO_2
= (0.44 lb-CO/year)/ (28 lb/lb-mole) x (44 lb/lb-mole)
= 0.69 lb-CO_2/year
= 1 lb-CO_2/year (rounded to zero significant digit per District Policy)

Specific electricity consumption for the blower is:

0.5 hp x 20 min/day x 1 hr/60 min x 0.7457 kW/hp x (1/90%) = 0.138 kWh/day

Indirect GHG Emissions are:

0.138 kWh/day x 0.524 lb-CO_2 per kWh x 365 days/year = 26 lb-CO_2/year

Therefore, the total GHG from Phase II vapor recovery system with Hirt burner are:

Total GHG from Hirt burner = 1,808 + 1 + 26 = 1,835 lb-CO_2/year

The Baseline Emission Factor is therefore,

BEF_C = 1,835 lb-CO2/year

<u>c) Calculations of Overall Baseline Emissions Factor</u>:

The overall Baseline Emission Factor (BEF) is calculated as follows:

BEF = 0.70 x BEF_a + 0.20 x BEF_b + 0.10 x BEF_c
= 0.70 x 0 + 0.20 x 633 lb-CO2/year + 0.10 x 1,835 lb-CO2/year

BEF = 310 lb-CO2/year

To convert this emission factor in terms of per unit activity, it is assumed that a typical gasoline station with 8 gasoline Fueling Points (FP) and maximum gasoline throughput of 1,800 gallons/day/FP, the annual gasoline throughput is 5,256,000 gallons/year (or 5,256 x 1,000 gallon/year). Thus:

BEF = (310 lb-CO2/year) / (5,256 x 1,000 gallons/year)

BEF = 0.059 lb-CO2/1,000 gallons

APPENDIX 5

Calculations for GHG Emissions from Hirt Burner (with Combustion Emissions)

Determination of GHG Emissions from Hirt Burner

ARB has currently certified several Phase II EVR vapor recovery systems for GDFs subject to ARB EVR timeline. Currently three balance systems (under ARB executive orders VR-205, VR-207, and VR-208) involve with Hirt VCS 100 burner. Under normal conditions, these balance systems do not involve in any vacuum pump to draw gasoline vapors and Hirt burner typically does not operate during that time. However, when pressure in the ullage space rises above the allowable limit, Hirt burner activates and starts drawing excess vapor with a turbine and incinerates until pressure in the ullage is within the allowable range. The ullage pressurization occurs mostly during periods of less activity, e.g. station being shut down overnight, winter fuels present, etc. ARB has determined that a typical Hirt burner operates only a maximum of 20 minutes a day.

A. Basis and Assumptions:

- Direct GHG emissions consist of CO_2 and CO emissions from combustion of gasoline vapors in the Hirt burner.
- Maximum CO_2 and CO emissions from combustion of gasoline vapors in the Hirt burner are 14.9 lb/hr and 0.0036 lb/hr, respectively (ARB determination).
- Hirt burners maximum run time is 1,197 sec/day (ARB determination)
- Indirect emissions are produced due to operation of a ½ hp electric motor-driven vacuum blower associated with the Phase II vapor recovery system.
- The vacuum blower is estimated to operate 20 minutes per day.
- Indirect emissions from electric power consumptions are calculated based on the current PG&E electric power generation factor of 0.524 lb-CO2 per kWh
- Electric motor efficiency is 90%

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

<u>Direct GHG emissions are:</u>

CO_2 emissions = 14.9 lb/hr x 1 hr/3,600 sec x 1,197 sec/day x 365 days/year = 1,808 lb-CO_2/year

CO emissions = 0.0036 lb/hr x 1 hr/3,600 sec x 1,197 sec/day x 365 days/year = 0.44 lb-CO/year
To convert CO emissions in terms of CO_2 emissions, the following chemical reaction is used:

$CO + ½ O_2$ ------------→ CO_2

Thus one lb-mole of CO will generates one lb-mole of CO_2. Therefore,

(lb-CO_2/year)/Mol Wt of CO_2 = (lb-CO/year)/Mol Wt of CO

or

lb-CO_2/year = (lb-CO/year)/Mol Wt of CO x Mol Wt of CO_2

= (0.44 lb-CO/year)/ (28 lb/lb-mole) x (44 lb/lb-mole)

= 0.69 lb-CO_2/year

= 1 lb-CO_2/year (rounded to zero significant digit per District Policy)

Specific electricity consumption for the blower is:

0.5 hp x 20 min/day x 1 hr/60 min x 0.7457 kW/hp x (1/90%) = 0.138 kWh/day

Indirect GHG Emissions are:

0.138 kWh/day x 0.524 lb-CO_2 per kWh x 365 days/year = 26 lb-CO_2/year

Therefore, the total GHG from Phase II vapor recovery system with Hirt burner are:

Total GHG from Hirt burner = 1,808 + 1 + 26 = 1,835 lb-CO_2/year
= (1,835 lb-CO2/year) / (5,256 x 1,000 gallons/year)
= 0.349 lb-CO2/1,000 gallons

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

$G_p = G_a$ / BEF = 0.349/0.059 x 100 = 592 %

APPENDIX 6

Calculations for GHG Emissions from Technologically Feasible Options

1. Healy with Clean Air Separator (VR-201 or VR-202):

A. Basis and Assumptions:

- Direct GHG emissions are zero since methane emissions from gasoline tanks are negligible and there are no combustion processes involved.
- This facility may operate 24 hours per day, 365 days per year (worst case).
- Stations are designated to handle peak gasoline dispensing periods, so an estimated use factor of 50% is considered conservative.
- If the time that a vehicle spends at a fueling point (FP) is 8 minutes, only about 2 minutes of that time is actually spent dispensing fuel . Therefore, a utilization factor of 0.25 will be used for calculations.
- For a Healy system, each gasoline dispenser is equipped with a Healy model VP1000 vacuum pump with a 1/8 hp electrical motor.
- For this BPS evaluation, it is assumed that the gas station has 4 gasoline dispensers with 8 fueling points (FPs) and 8 gasoline dispensing nozzles.
- The vacuum pump operates at two speeds: low speed is in response to one fueling point being activated, and high speed when both fueling points are activated simultaneously.
- Based on previous assumptions, maximum time that a vacuum pump operates is calculated as: 1,440 min/day × 0.25 × 0.5 = 180 min/day/FP.
- Indirect emissions from electric power consumptions are calculated based on the current PG&E electric power generation factor of 0.524 lb-CO2 per kWh
- Electric motor efficiency is 90%

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

<u>Direct GHG emissions are zero:</u>

Total daily electricity consumption for 4 vacuum pumps is:

1/8 hp x 180 min/day/FP x 8 FP x 1 hr/60 min x 0.7457 kW/hp x (1/90%) = 4.47 kWh/day

Indirect GHG Emissions are:

4.47 kWh/day x 0.524 lb-CO_2 per kWh x 365 days/year = 855 lb-CO_2/year

Therefore, the total GHG from Phase II vapor recovery system with **Clean Air Separator** are:

Total GHG from Healy (VR-201, VR-202) = 0 + 855 = 855 lb-CO_2/year
= (855 lb-CO2/year) / (5,256 x 1,000 gallons/year)
G_a = 0.163 lb-CO2/1,000 gallons

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

$G_p = G_a$ / BEF = 0.163/0.059 x 100 = 276 %

2. VST with VST Membrane Processor (VR-203 or VR-204):

A. Basis and Assumptions:

- Direct GHG emissions are zero since methane emissions from gasoline tanks are negligible and there are no combustion processes involved.
- This facility may operate 24 hours per day, 365 days per year (worst case).
- VST Membrane Processor is equipped with a two vacuum pumps each with a 1/2 hp electrical motor.
- Each vacuum pump associated with the membrane processor operates 4 hours per day.
- Indirect emissions from electric power consumptions are calculated based on the current PG&E electric power generation factor of 0.524 lb-CO2 per kWh.
- Electric motor efficiency is 90%

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

Direct GHG emissions are zero:

Total daily electricity consumption for two vacuum pumps is:

2 pumps x 1/2 hp x 4 hr/day x 0.7457 kW/hp x (1/90%) = 3.31 kWh/day

Indirect GHG Emissions are:

3.31 kWh/day x 0.524 lb-CO_2 per kWh x 365 days/year = 633 lb-CO_2/year

Therefore, the total GHG from Phase II vapor recovery system with VST Membrane Processor are:

Total GHG from VST (VR-203, VR-204) = 0 + 633 = 633 lb-CO_2/year
= (633 lb-CO2/year) / (5,256 x 1,000 gallons/year)

G_a = 0.120 lb-CO2/1,000 gallons

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

$G_p = G_a$ / BEF = 0.120/0.059 x 100 = 203 %

3. VST with Veeder-Root Vapor Polisher (VR-203 or VR-204):

Assumptions

- Direct GHG emissions are zero since methane emissions from gasoline tanks are negligible and there are no combustion processes involved.
- The electrical component with VST Veeder-Root Vapor Polisher is the pressure sensor switch and solenoid that activates with pressure increase to allow gasoline vapors to flow to the carbon canister. Since the electricity used by these components is minimum, it is assumed that the indirect GHG emissions are negligible.

Calculations

Total Direct and indirect GHG emissions are zero:

4. VST with Healy Clean Air Separator (VR-209):

Assumptions

- Direct GHG emissions are zero since methane emissions from gasoline tanks are negligible and there are no combustion processes involved.
- This is a balance system with no electrical requirements. Therefore, indirect GHG emissions are zero.

Calculations

Total Direct and indirect GHG emissions are zero: