ATTACHMENT 5

Technical Support Document for the Development of *Test Procedure TP-206.4, Volumetric Efficiency for Phase I Systems for Aboveground Storage Tanks*

California Environmental Protection Agency

Air Resources Board

Monitoring and Laboratory Division
Engineering and Certification Branch
Engineering Evaluation Section

Technical Support Document for the Development of *Test Procedure TP-206.4, Volumetric Efficiency for Phase I Systems for* Aboveground Storage Tanks

Date: January 29, 2014

ACKNOWLEDGEMENTS

ARB staff would like to acknowledge the following organizations who made a significant contribution to the development and success of the new test procedure:

- Donlee Pump (Ceres, CA)
- E.R. Vine (Ceres, CA)
- Morrison Brothers (Dubuque, Iowa)
- South Coast Air Quality Management District

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Introduction

On July 25, 2013, the Air Resources Board (ARB or Board) staff presented to the Board a set of proposed amendments to Test Procedure TP-201.1*, Volumetric Efficiency for Phase I Systems.* The proposal would revise TP-201.1 to make it suitable for determining the volumetric efficiency of Phase I systems installed on gasoline aboveground storage tanks (AST). A Phase I system reduces emissions into the air when gasoline is transferred from the cargo tank to the AST.

The proposed revisions to TP-201.1 took into account that AST pressurization is due to the heat and light intensity from the sun, which then results in the release of hydrocarbons into the air regardless of any testing that is occurring. These emissions are referred to as standing losses. Considering the nature of ASTs, ARB staff modified the procedure to delete the up to one-hour post-delivery waiting period that is appropriate and useful when testing underground storage tanks (UST). The justification was that the venting occurring after the conclusion of the delivery was attributed to standing loss emissions that would be taking place rather than any backpressure created by the Phase I Enhanced Vapor Recovery (EVR) system. The modification would apply only to the certification of AST Phase I systems and would not apply to the certification of UST Phase I systems.

During the public comment period, ARB staff received a comment from the South Coast Air Quality Management District (SCAQMD), raising concerns about the possibility of the proposed changes not being sufficient to address the issues seen in ASTs:

> *"Under the current test method, vapor displacements from an AST are measured at the two possible venting routes – vapor return line to the delivery truck and the pressure relieve valve installed in the vent line of the AST throughout the delivery process and after the delivery process has ended until no more venting occurs. The purpose for measuring any vented volume after delivery has ended is to capture all venting due to any pressure build up within the storage tank. The proposed amendment seeks to stop the measurement right after the delivery process has ended. Doing so would ignore any pressure built-up in the storage tank due to the delivery and would almost always guarantee a passing certification test. A better approach can be to add to the current procedures time of evaluation, the extra vented volume can then be discounted to determine the full impact of the delivery process and the actual volumetric efficiency of the system being tested."*

SCAQMD staff suggested that ARB staff revisits a previous concept of directly measuring the standing losses that occur outside the fuel transfer process. See Attachment 1 for the full comment from SCAQMD.

In response to SCAQMD's comment, ARB staff agreed to look into the feasibility of modifying the test procedure to quantify and deduct baseline standing loss emissions that occur prior to delivery. While laboratory testing was not successful, ARB staff

believed that a method could be developed which would better characterize emissions associated with Phase I fuel transfers and standing losses. Additionally, since there would be substantial differences between the procedures for determining the transfer efficiency of Phase I systems between UST and AST, staff decided that creating a separate procedure specifically for AST would beneficial. TP-201.1 will continue to be applicable for determining the volumetric efficiency for Phase I systems installed on USTs. A new test procedure, *TP-206.4, Volumetric Efficiency of Phase I Systems for Aboveground Storage Tanks (TP-206.4)*, would apply specifically for determining the volumetric efficiency for Phase I systems installed on ASTs.

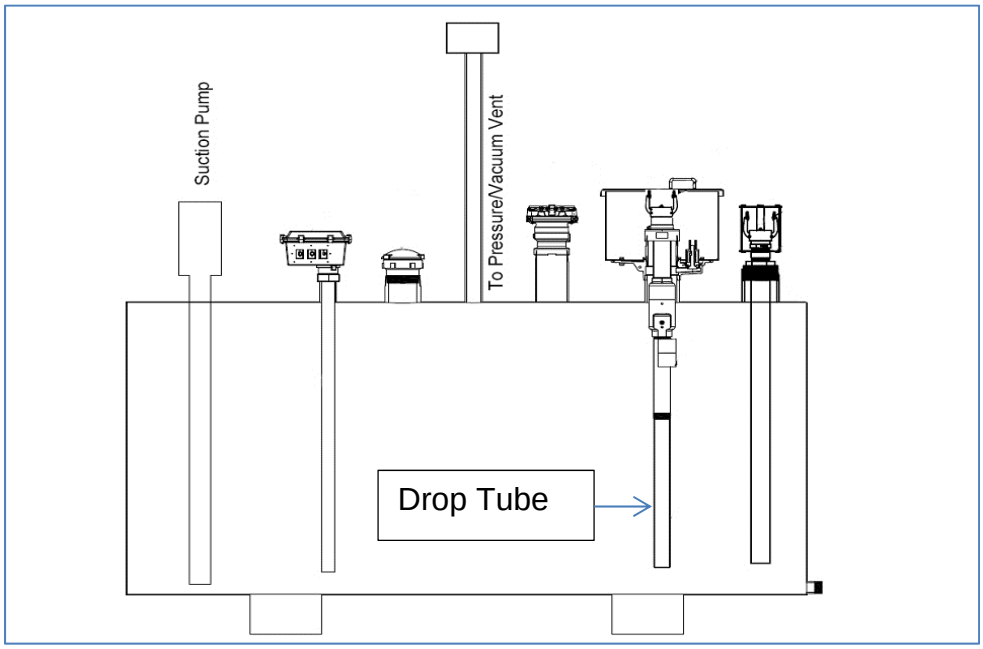
The four objectives of this document are:

1. To describe the development and validation of a new test procedure (to replace the one presented to the Board on July 25, 2013);
2. To describe the field testing of a new test procedure;
3. To present results of that testing; and
4. To conclude that this new test procedure is suitable for determining the volumetric efficiency of Phase I systems installed on ASTs.

Background

ARB is responsible for the evaluation and certification of Phase I EVR systems designed for use with UST and AST systems installed at gasoline dispensing facilities or GDFs. Over the last decade, ARB has certified a total of seven Phase I EVR systems for both UST and AST applications. Until 2011, every system evaluated has successfully passed efficiency testing. See Figure 1 for a typical Phase I EVR system for ASTs.

Figure 1: Typical Phase I Vapor Recovery System for Aboveground Storage Tanks



ARB Phase I EVR System Performance Standards

According to ARB Certification Procedure CP-206 (applies to vapor recovery systems designed for use with ASTs), Phase I EVR systems must achieve a volumetric transfer efficiency of at least 98.0% as determined by TP-201.1, Volumetric Efficiency for Phase I Vapor Recovery Systems. In addition, Phase I EVR components must maintain leak integrity during idle periods and during periods of fuel transfer. In order to demonstrate compliance with these standards, equipment manufacturers seeking ARB certification are required to demonstrate compliance by installing their systems at an operating gasoline dispensing facility (GDF). Once the system is installed, ARB certification staff will evaluate the durability and performance of the system for at least 180 days. During this time frame, a number of tests are conducted to determine whether the components can maintain leak integrity and if the system can achieve a volumetric transfer efficiency of at least 98.0%. Typically, the efficiency testing is conducted once every sixty days (3 times) and leak integrity testing is conducted every thirty days (6 times).

Volumetric Efficiency Testing:
Volumetric efficiency testing for Phase I EVR systems quantifies the transfer efficiency when a bulk gasoline delivery occurs between a cargo tank and either a UST or an AST. TP-201.1 is used to determine compliance with the 98.0% transfer efficiency performance standard specified in the certification procedure.

The principle behind TP-201.1 is that during a gasoline delivery, the cargo tank and gasoline dispensing facility (GDF) are temporarily equipped with positive displacement meters (called roots meters) that measure the volume of vapor returned to the cargo tank and the volume of vapor discharged through the vent pipe, if any. Through various recordings of temperature and pressure, these volumes are corrected to standard conditions and collection efficiency is calculated as follows:

$$E = (100)\left[\frac{V_{returned} - V_{vent}}{V_{returned}}\right]$$

Where:

E	=	Phase I Volumetric Efficiency, percent
$V_{returned}$	=	Corrected Vapor Return Volume to Cargo Tank
V_{vent}	=	Corrected Vapor Return Volume Discharged Vent Pipe

In 2011 and 2012, while performing certification testing for the Morrison Brothers Phase I EVR system, designed for single-wall AST applications, ARB staff witnessed three failures to achieve the efficiency standard utilizing TP-201.1. Failure of this test resulted in direct emissions to the atmosphere. A fourth attempt in February of 2012, resulted in meeting the efficiency standard. The inconsistency of the results indicated a wider problem for future certifications and for in-use applications. Further investigation revealed that for ASTs only, standing loss emissions (emissions that take place due pressure build-up during diurnal temperature variations) can occur while efficiency testing is taking place, causing additional venting that is not attributed to the Phase I EVR system. It is this additional venting that can bias the efficiency test towards failure. See Figure 2 for a typical pressure profile of a single-wall AST.

When utilized on a standard UST, TP-201.1 and the above equation work as expected. However, as currently written, TP-201.1 is inadequate for ASTs, which tend to be much smaller, are exposed directly to sunlight and diurnal temperature fluctuations, and are more prone to pressure driven vent emissions known as “standing losses.” These factors, smaller tank size and rapid temperature fluctuations, were not considered when TP-201.1 was originally written and applied to ASTs. By not including standing loss into the efficiency equation, it would penalize a Phase I system for ASTs. To address conditions that are specific to ASTs, such as standing loss, ARB staff is proposing to modify TP-201.1.

Figures 3(a-f) provide images of efficiency testing conducted at gasoline dispensing facilities equipped with ASTs.

Figure 2: Typical Pressure vs. Temperature Profile of Single Wall AST

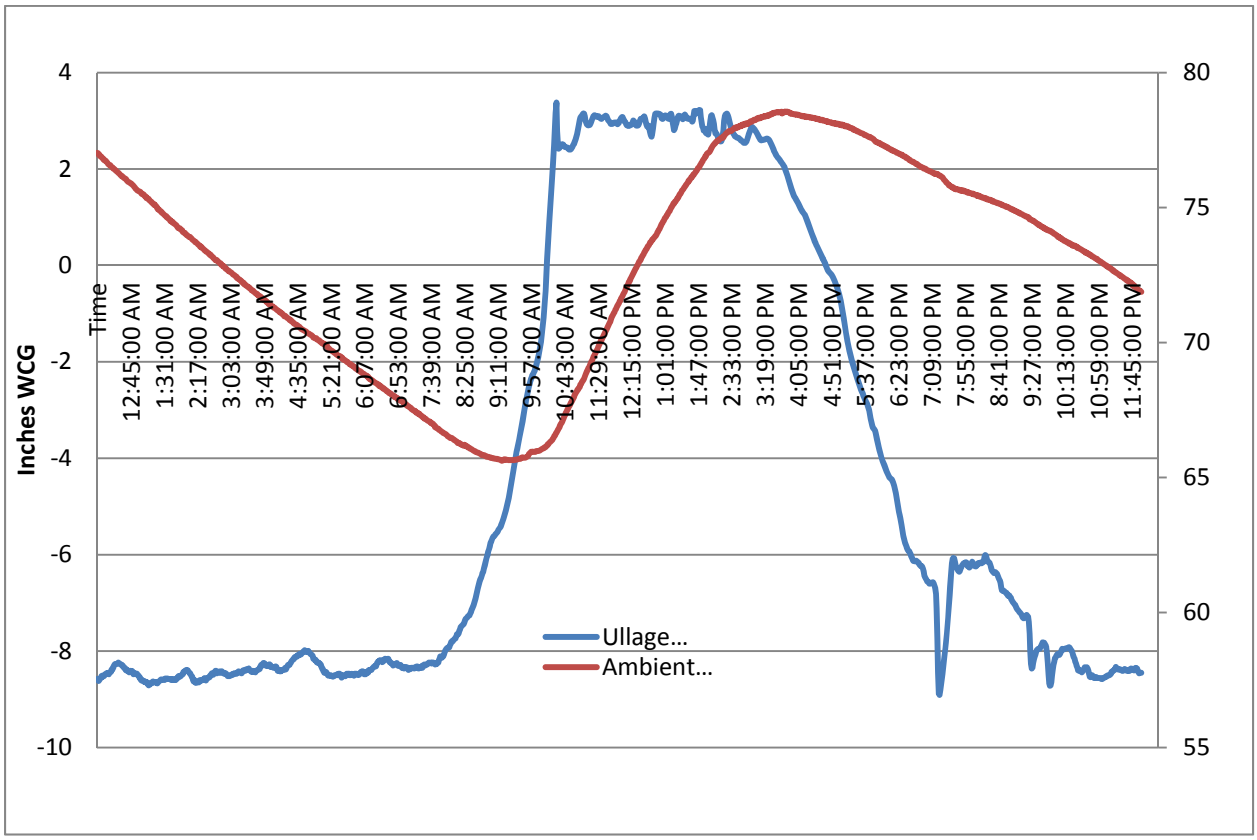


Figure 3(a-f): Phase I Efficiency Testing Conducted on AST

Fuel Transfer from Cargo Tank to AST

PV-Zero Installed on Vent Line

Manometer Installed on Vent Line

Volume Meter Installed on Vent Line

Volume Meter Installed on Vapor Return

Product and Vapor Lines During Delivery

Proposed Test Procedure TP-206.4

In order to better address the differences between USTs and ASTs, proposed TP-206.4, *Volumetric Efficiency for Phase I Vapor Recovery Systems for Aboveground Storage Tanks,* was developed to apply specifically to ASTs. TP-201.1 remains unchanged and applies specifically to USTs. TP-206.4 would mirror TP-201.1, but would add several steps to establish a standing loss baseline prior to the fuel delivery, and differentiate between vent line emissions that occur during the delivery, but which are attributed exclusively to standing losses and not the delivery. Once this baseline is established, it can be subtracted from the measured vent volume.

Before the standing losses can be identified and separated out of the efficiency equation, a baseline must be established. TP-201.1 requires the monitoring of pressure and vent emission for one hour after delivery if certain conditions occur. Staff believes that it is appropriate to determine the baseline by directly measuring the amount of vapor discharged through the GDF pressure/vacuum vent valve (P/V valve), during the one-hour period prior to delivery. This would be achieved by installing a small roots meter, which would measure volume in cubic feet for one hour prior to the delivery. In the past, ARB staff had attempted this method, but found that direct reading could not be obtained due to the design of the Husky pressure/vacuum (P/V) vent valve. Further evaluation proved that venting through the Franklin Fueling Systems PV-Zero P/V valve (PV-Zero) provided enough volume that could be measured by the roots meter. In running proposed TP-206.4, it will be necessary to replace the existing Husky P/V valve with the PV-Zero (see Figure 4 for a typical equipment setup during efficiency testing). The volume recorded in cubic feet during this one-hour period prior to delivery will become the baseline standing loss.

After the fuel delivery, the proposed test procedure would continue to require monitoring of venting for one hour after delivery, if the pressure is at or greater than 1.0 inches WC 15 minutes after delivery. In this one-hour period, a portion of the volume vented is attributed to standing losses when the tank is heated by the sun.

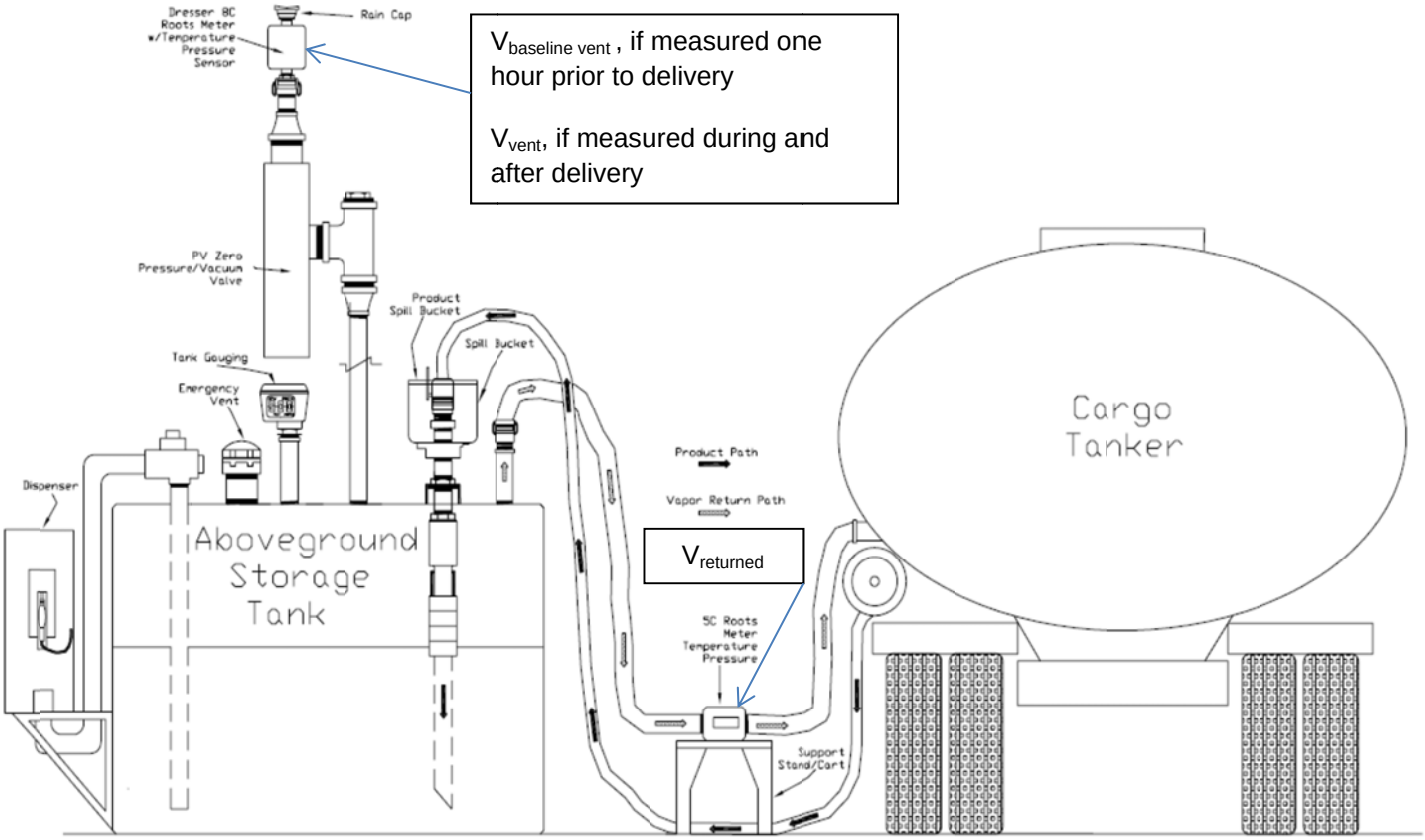
To determine the volumetric efficiency, the following modified equation would be used. This modified equation would allow the correction of standing loss. V_{vent} is the volume measured at the vent during and after delivery. $V_{baseline\ vent}$ is the vent volume recorded one hour prior to delivery.

$$E = (100)\left[\frac{V_{returned} - \left(V_{vent} - V_{baseline\,vent}\right)}{V_{returned}}\right]$$

Where:

E	=	Phase I Volumetric Efficiency, percent
$V_{returned}$	=	Corrected Vapor Return Volume to Cargo Tank
V_{vent}	=	Corrected Vent Pipe Discharged Volume
$V_{baseline\ vent}$	=	Baseline Standing Loss Vent Volume

Figure 4: Typical Representation of Equipment Setup During Delivery



Test Site Information

To further develop and verify the effectiveness of the new test procedure, field testing would need to be conducted on a small, single-walled steel AST because these tanks are most sensitive to diurnal heating and cooling. Staff obtained permission to utilize a 540-gallon, single-wall AST located in Ceres, California. ARB staff also obtained assistance from E.R. Vine/Donlee Pump to provide the fuel transfers for each field test.

The AST used for testing was fitted with the Morrison Brothers' Phase I EVR system. The tank is located on-site at Donlee Pump Company, which splits its property with E.R. Vine & Sons (see Figure 5 below for location), the bulk plant which is the source of the gasoline for the tests. The AST was painted with the PPG Durathane coating system, which is certified for standing loss control by Executive Order VR-301, and is fitted with an uncertified P/V valve from a manufacturer that is currently conducting research and development testing.

For the purposes of the field tests, ARB staff installed a second vent line and the PV-Zero, which is the only P/V valve that can be used during the field tests. See Figure 6 for an example of a PV-Zero installation. ARB staff also installed ball-valves under the PV-Zero and the uncertified P/V valve, so that when staff was not performing an efficiency test, the uncertified P/V valve would be the only operational P/V valve on the AST. This feature allowed ARB staff to leave the PV-Zero on the test tank without disrupting the manufacturer's research and development testing.

Additionally, ARB staff installed a data acquisition system which continuously monitored and recorded the following parameters:

- AST ullage pressure;
- Ambient temperature;
- Barometric pressure; and
- Battery voltage.

The information obtained from the data acquisition system is presented in the "Field Trials" section of this report and is useful to illustrate the behavior of the PV-Zero vent valve and the effect of temperature changes.

Figure 5: Map Location of Donlee Pump Company

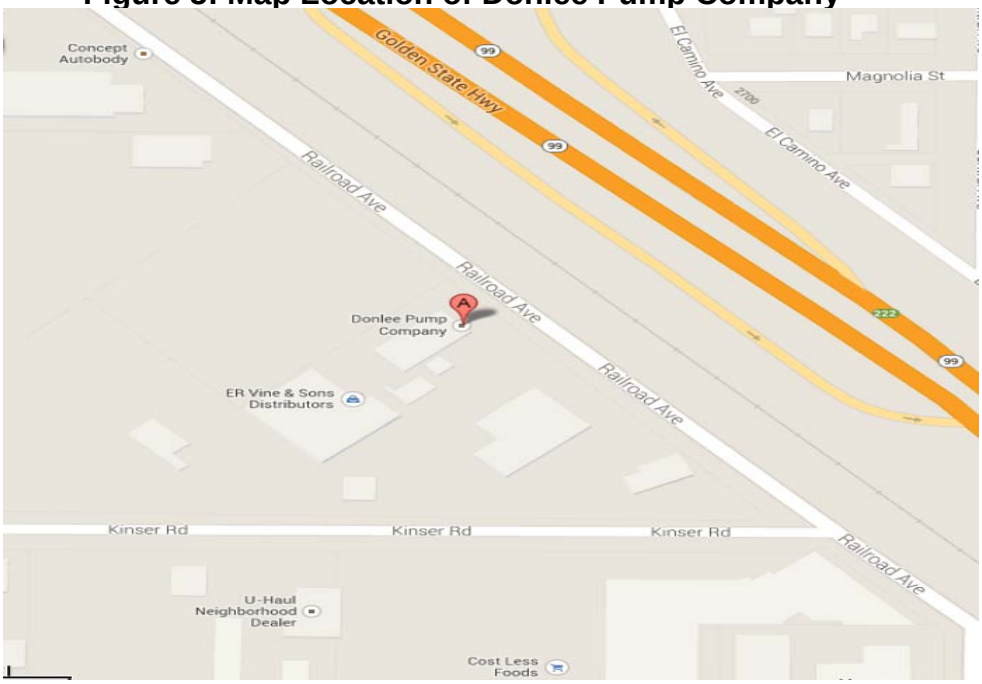


Figure 6: Installation of PV-Zero and Flow Meter

Field Tests

ARB staff decided that at least four field tests of the new test procedure would be necessary to evaluate its effectiveness in the field, given the late summer timeframe for testing and the need to finalize the proposed procedure in the fall to continue the rule-making process. For each test run, the amount of fuel left in the AST and the amount of fuel delivered for each test run was varied in order to evaluate the robustness of the proposed test procedure and simulate actual delivery conditions. Prior to testing, the AST was fitted with the PV-Zero and other necessary testing equipment so that the instrumentation would not have to be installed and removed for each individual test. The following information describes the events of the four test runs.

First Efficiency Test Utilizing the New Test Procedure: 08/28/13

For the first test run, ARB staff requested that the AST contain approximately one-third of its capacity of gasoline. This resulted in 183 gallons of gasoline in the AST, leaving an ullage of 357 gallons. ARB staff arrived on site at approximately 10:00 AM and immediately set up the test equipment, such as a roots meter, to establish a baseline standing loss vent volume.

The cargo truck arrived at 12:55 PM, and attached the product delivery line and vapor line to the AST and through one of the roots meters (for vapor return to the truck). ARB staff used the one hour period prior to delivery to calculate the baseline standing loss vent volume, which was 1.26 ft^3, or 9.43 gallons, of vapor lost during normal diurnal venting.

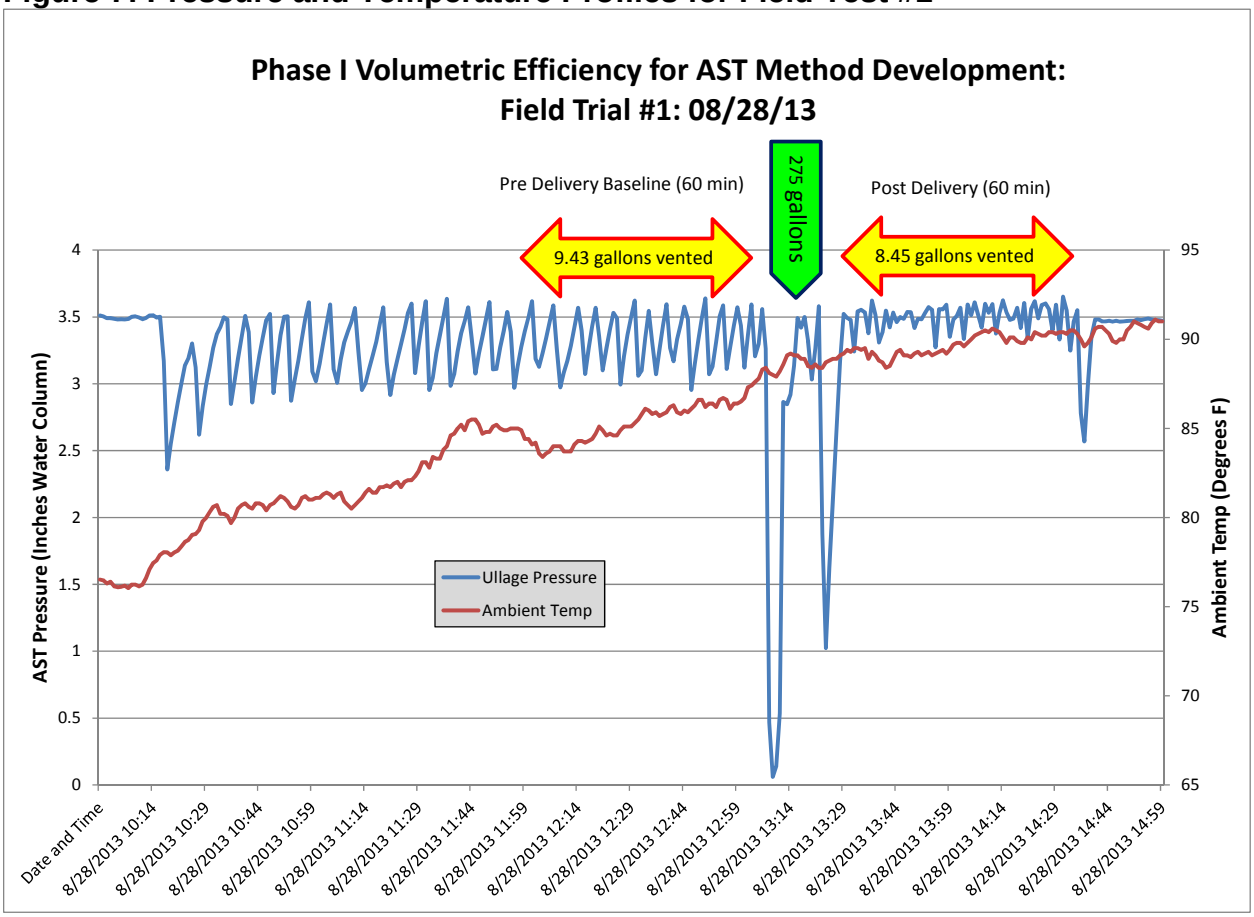
The fuel delivery occurred between 1:05 PM and 1:10 PM, where 275 gallons of gasoline was transferred from the cargo tank to the AST, resulting in the transfer of 38.0 ft^3, or 284.28 gallons, of vapor from the AST to the cargo tank. During this time, the AST emitted 0.78 ft^3, or 5.84 gallons of vapor through the vent line.

The test was not concluded until 15 minutes after the fuel drop. If the tank pressure is greater than 1.0 inches WC at the end of 15 minutes, then the vapor loss through the vent line must be recorded for an additional 45 minutes. Immediately after the fuel drop, the AST's pressure was already greater than 3.75 inches WC. Therefore staff had to wait for an additional 45 minutes.

After one hour, an additional 1.13 ft^3 of vapor was lost through the vent line, which resulted in a total loss of 1.91 ft^3, or 14.29 gallons, of vapor lost during the fuel transfer and subsequent waiting period. Using the equation on Page 10, the volumetric efficiency was calculated to be 98.3%. See Table 1 for results.

Figure 7, below, depicts the pressure and temperature profiles seen before, during, and after the efficiency testing for Field Trial #1. The figure highlights the temperatures and pressures seen during the period of time in which the baseline standing loss volume was obtained, the product delivery, and in the one-hour waiting period directly after delivery.

Figure 7: Pressure and Temperature Profiles for Field Test #1



<u>Second Efficiency Test Utilizing the New Test Procedure: 09/11/13</u>

A second efficiency test was conducted on September 11, 2013. For this test, ARB staff requested that prior to the delivery, that the AST contain approximately 10% of its capacity in gasoline. Donlee Pump staff left approximately 75 gallons of gasoline, leaving an ullage of 465 gallons. A delivery of 400 gallons was scheduled.

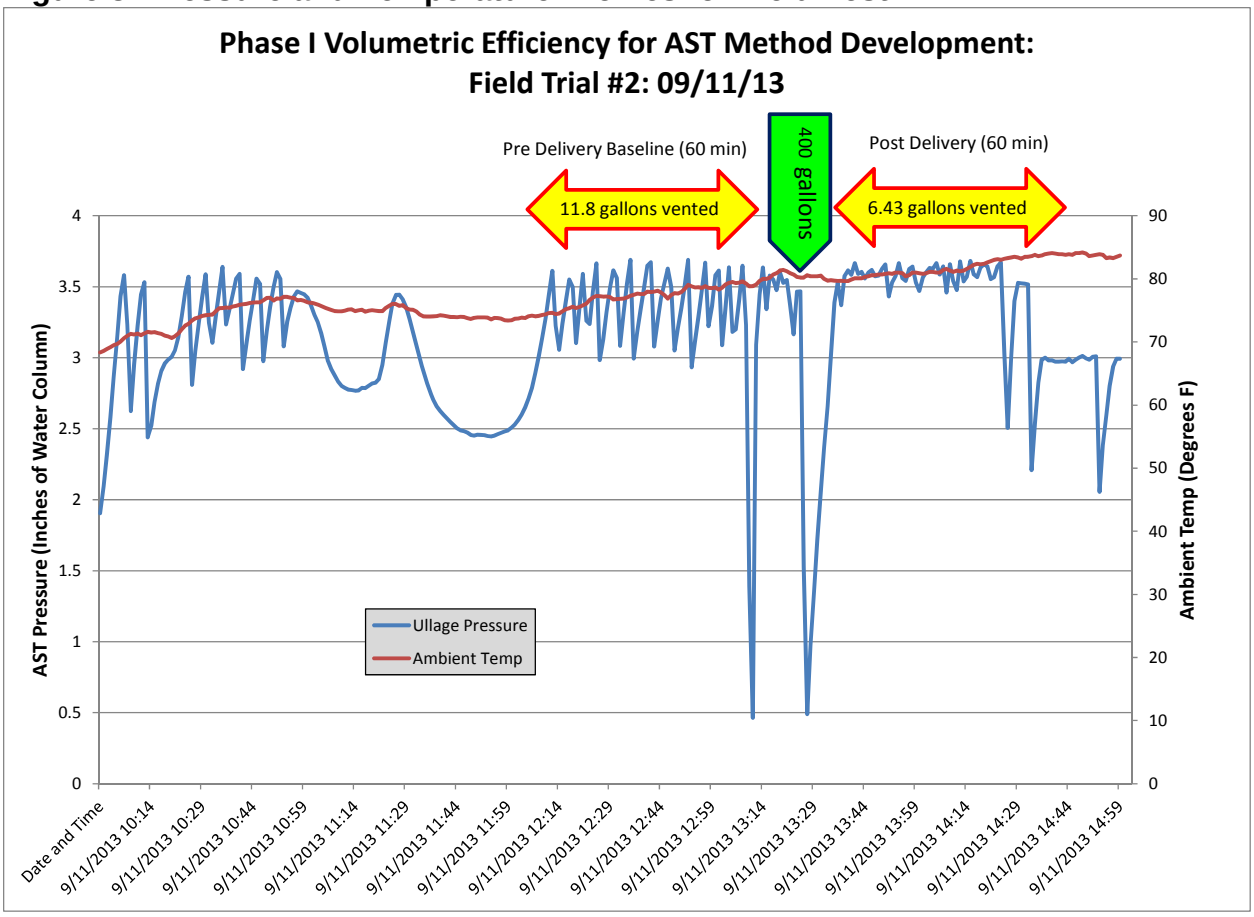
ARB staff arrived at approximately 10:00 AM and began setting up roots meters on the vapor return and vent stack and started taking readings to establish a baseline standing loss vent volume. The cargo truck arrived at approximately 1:10 PM and the driver began to set up the product and vapor lines for the delivery. The time period between 12:15 PM and 1:15 PM was used to establish the standing loss vent volume baseline of 1.58 ft^3, or 11.82 gallons.

The fuel drop occurred between 1:16 PM and 1:22 PM in which 400 gallons of gasoline was dropped into the AST and 54 ft^3, or 403.97 gallons, of vapor was returned to the cargo truck. During the fuel drop, 1.74 ft^3, or 13.02 gallons of vapor was vented through the P/V valve and vent meter. After 15 minutes of waiting, the AST ullage pressure was

3.19 inches of WC, necessitating ARB staff to wait an additional 45 minutes for the conclusion of the test.
At the end of the hour, the AST vented 2.60 ft^3, or 19.45 gallons of vapor (including venting during and after delivery). Subtracting the baseline vent volume from the volume vented after one hour resulted in a volume of 1.02 ft^3 or 7.63 gallons. The calculated volumetric efficiency was 98.1% using the equation in the background section. See Table 1 for results.

See Figure 8, below, for the pressure and temperature profiles seen before, during, and after the efficiency testing for Field Trial #2. The figure highlights the temperatures and pressures seen during the period of time in which the baseline standing loss volume was obtained, the product delivery, and in the one-hour waiting period directly after delivery.

Figure 8: Pressure and Temperature Profiles for Field Test #2



<u>Third Efficiency Test Utilizing the New Test Procedure: 09/18/13</u>

On September 18, 2013, ARB staff performed a third test run of the proposed TP-206.4 efficiency test. For this test, ARB staff requested that prior to the delivery that the AST be at approximately 25% capacity. Fuel volume was reduced to 135 gallons, leaving an ullage of 405 gallons. A delivery of 325 gallons of gasoline was scheduled.

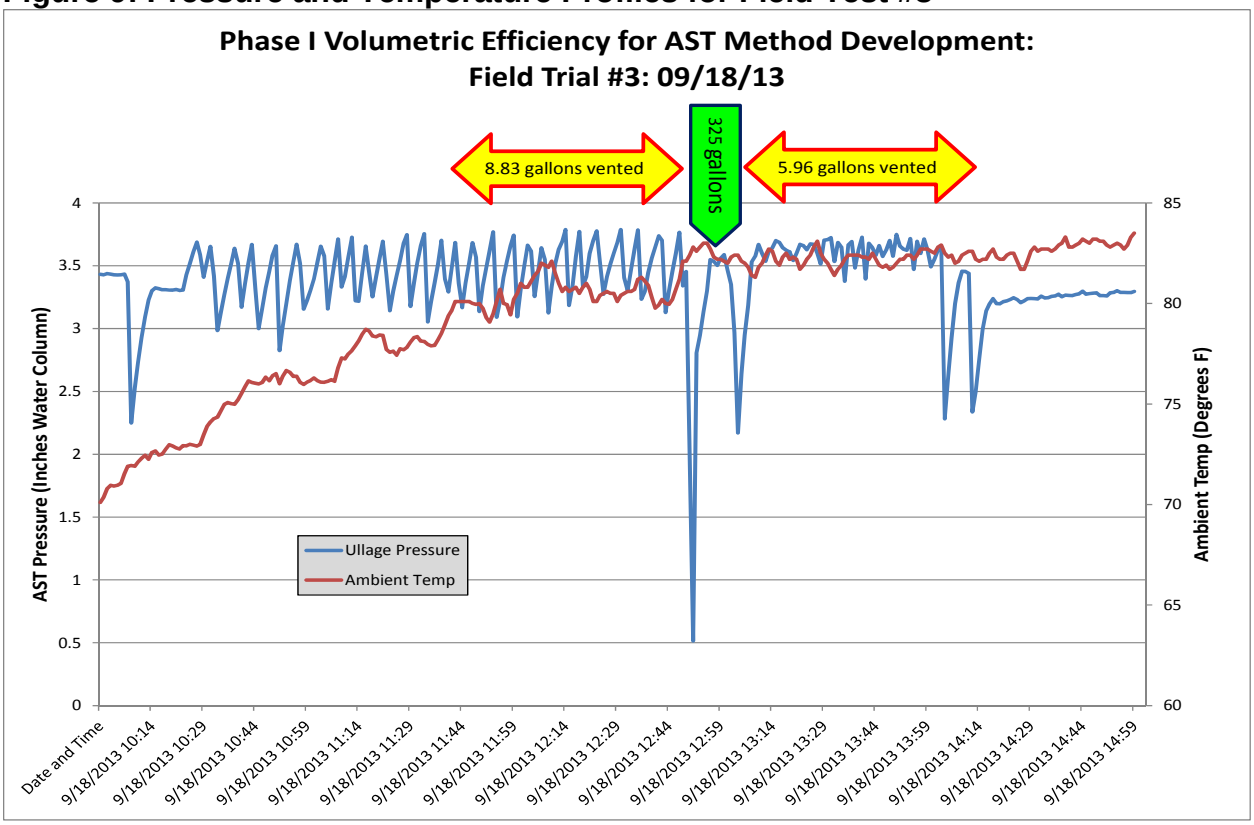
After arriving at the site around 10:00 AM, ARB staff installed roots meters on the vent stack and vapor return. When set-up was completed, staff began monitoring the vent to establish the baseline standing loss vent volume. At approximately 12:50 PM, the cargo truck arrived and began hooking up the product and vapor lines. At this point, ARB staff used the time between 11:50 AM and 12:50 PM to establish the baseline standing loss vent emissions at 1.18 ft^3, or 8.83 gallons.

Between 12:56 PM and 1:01 PM, 325 gallons of fuel was delivered while 44 ft^3, or 329.16 gallons, of vapor was returned to the cargo truck. During the delivery, the AST vented 0.72 ft^3, or 5.39 gallons of vapor. After 15 minutes, the AST was at 3.68 inches WC, necessitating that ARB staff record readings for the next 45 minutes.

At the end of the one hour waiting period, the AST had vented a total of 1.52 ft^3, or 11.37 gallons of vapor during both the delivery and the waiting period. Using the baseline standing loss vent volume and the modified efficiency equation, the AST had a passing transfer efficiency of 99.2%. See Table 1 for results.

Figure 9, demonstrates the pressure and temperature profiles seen before, during, and after the efficiency testing for Field Trial #3. The figure highlights the temperatures and pressures seen during the period of time in which the baseline standing loss volume was obtained, the product delivery, and in the one-hour waiting period directly after delivery.

Figure 9: Pressure and Temperature Profiles for Field Test #3



Fourth Efficiency Test Utilizing the New Test Procedure: 09/25/13

On September 25, 2013 ARB staff traveled to Ceres to perform a fourth test run of the proposed TP-206.4. Once again, prior to traveling to Ceres, ARB staff requested that prior to delivery the AST be at approximately 25% capacity. The AST volume was lowered to 148 gallons of fuel, leaving 392 gallons of ullage. A delivery of 300 gallons was scheduled for approximately 1:00 PM.

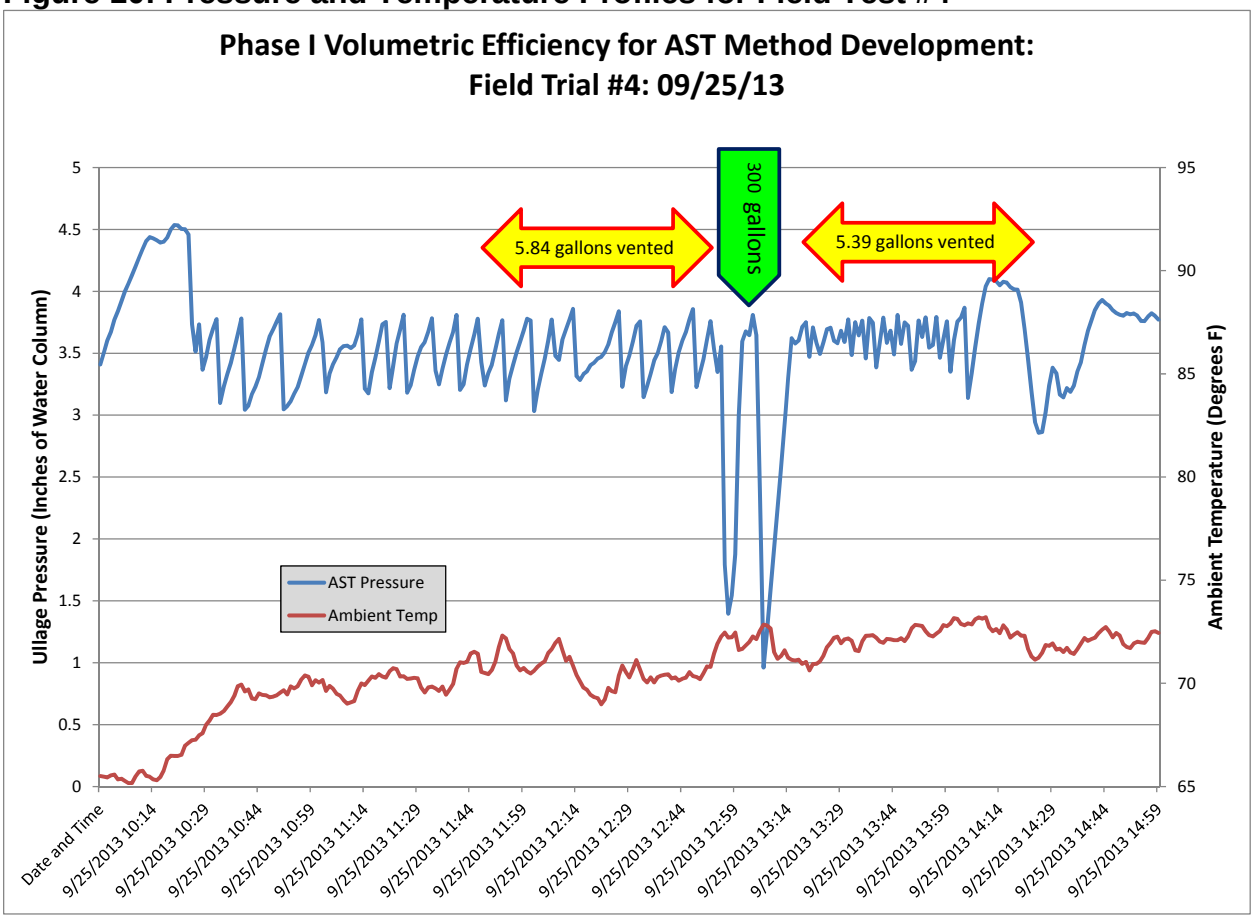
ARB staff arrived at 10:00 AM, set up the test equipment, and began monitoring the vent line to establish the baseline standing loss vent volume. The cargo truck arrived at approximately 12:50 PM, and the time frame between 11:55 AM and 12:55 PM was used to determine the baseline standing loss of 0.78 ft^3, or 5.84 gallons.

After product and vapor lines were set up, the delivery took place between 12:59 PM and 1:03 PM. During this time, 300 gallons of fuel was dropped and 41.0 ft^3, or 306.72 gallons, of vapor was returned to the cargo truck. At 15 minutes, the AST was at 3.83 inches WC, requiring ARB staff to record venting for an additional 45 minutes.

After waiting for a full hour after the delivery, ARB staff recorded total venting at 1.28 ft^3, or 9.58 gallons, of vapor. Using the baseline standing loss vent volume obtained earlier, the transfer efficiency was calculated to be 98.8%. See Table 1 for results.

Figure 10, exhibits the pressure and temperature profiles seen before, during, and after the efficiency testing for Field Trial #4. The figure highlights the temperatures and pressures seen during the period of time in which the baseline standing loss volume was obtained, the product delivery, and in the one-hour waiting period directly after delivery.

Figure 10: Pressure and Temperature Profiles for Field Test #4



Results

Table 1 illustrates the results of the four efficiency field tests to develop TP-206.4 (fourth column). This table also compares the results utilizing the current procedure, TP-201.1, (second column) and the amendments proposed to TP-201.1 for the July 25, 2013 Board hearing (third column). As Table 1 demonstrates, each volumetric efficiency test would have failed for the AST using TP-201.1, where standing loss emissions are not accounted for during the one-hour waiting period. The test procedure recommended to the Board on July 25, 2013 (and amendment of TP-201.1) would have failed half the time, as it accounts for neither the baseline standing loss vent emission nor the one-hour waiting period. The new proposed test procedure, TP-206.4, which takes into account the standing loss emission baseline as well as the one-hour waiting period, passed each volumetric efficiency test.

ARB staff invalidated the results of the second field test due to the unusually large tank ullage present before the delivery. Even though the test yielded a passing result, staff believes that the large ullage (86% of tank volume) created a situation where the baseline vent emissions were uncommonly high. This is due to a greater pressurization of the headspace as the greater volume of fuel vapor volume heats and expands. Baseline vent emissions for Field Test #2 were nearly double the emissions seen during the one-hour post-delivery venting period, where the ullage volume after delivery was similar to the other tests. The unusually high ullage volume pre-delivery had the additional effect of creating a situation called ‘splash loading,’ where a fuel delivery into a nearly empty tank created highly agitated fuel, leading to increased pressure and venting during the actual delivery period (more than double the venting during the same period during the other three test runs). In this test run, the high baseline venting emissions and the high delivery emissions (both caused by unusually high ullage), cancelled each other out and resulted in a passing efficiency of 98.1%. Although Field Test #2 yielded a passing result, it included biases that should not be allowed. Based on observations of Field Test #2, staff amended the test procedure to specify that a maximum ullage of no greater than 80% is allowed when running the Phase I volumetric efficiency test on ASTs.

Table 1: Results of Phase I Efficiency Testing using TP-206.4

Field Tests		**Original Test Procedure, TP-201.1**	**Proposed Amendment to TP-201.1**	**New Proposed Test Procedure TP-206.4**
08/28/2013 Field Test #1 **Before Delivery:** 183 gallons fuel 357 gallons ullage **After Delivery:** 275 gallon drop 284.28 gal. vapor returned	Pass/Fail[1]	Fail	Fail	**Pass**
	Efficiency %	95.0%	97.9%	**98.3%**
	Vent Volume for Delivery	0.78 ft^3 5.84 gallons	0.78 ft^3 5.84 gallons	0.78 ft^3 5.84 gallons
	Vent Volume for 60 minutes	1.13 ft^3 8.45 gallons	NA	1.13 ft^3 8.45 gallons
	Baseline Emissions	NA	NA	1.26 ft^3 9.43 gallons
09/11/2013 Field Test #2[2] **Before Delivery:** 75 gallons fuel 465 gallons ullage **After Delivery:** 400 gallon drop 403.97 gal. vapor returned	Pass/Fail[1]	Fail	Fail	**Pass[2]**
	Efficiency %	95.2%	96.8%	**98.1%**
	Vent Volume for Delivery	1.74 ft^3 13.02 gallons	1.74 ft^3 13.02 gallons	1.74 ft^3 13.02 gallons
	Vent Volume for 60 minutes	0.86 ft^3 6.43 gallons	NA	0.86 ft^3 6.43 gallons
	Baseline Emissions	NA	NA	1.58 ft^3 11.82 gallons
09/18/2013 Field Test #3 **Before Delivery:** 135 gallons fuel 405 gallons ullage **After Delivery:** 325 gallon drop 329.16 gal. vapor returned	Pass/Fail[1]	Fail	**Pass**	**Pass**
	Efficiency %	96.6%	**98.4%**	**99.2%**
	Vent Volume for Delivery	0.72 ft^3 5.39 gallons	0.72 ft^3 5.39 gallons	0.72 ft^3 5.39 gallons
	Vent Volume for 60 minutes	0.80 ft^3 5.99 gallons	NA	0.80 ft^3 5.99 gallons
	Baseline Emissions	NA	NA	1.18 ft^3 8.83 gallons
09/25/2013 Field Test #4 **Before Delivery:** 148 gallons fuel 392 gallons ullage **After Delivery:** 300 gallon drop 306.72 gal. vapor returned	Pass/Fail[1]	Fail	**Pass**	**Pass**
	Efficiency %	96.9%	**98.6%**	**98.8%**
	Vent Volume for Delivery	0.56 ft^3 4.19 gallons	0.56 ft^3 4.19 gallons	0.56 ft^3 4.19 gallons
	Vent Volume for 60 minutes	0.72 ft^3 5.39 gallons	NA	0.72 ft^3 5.39 gallons
	Baseline Emissions	NA	NA	0.78 ft^3 5.84 gallons

[1]A passing Efficiency is 98.0%.
[2]Field Test #2 is invalidated due to bias caused by unusually large ullage.

Conclusion

Previous evaluations from ARB staff indicated that the standing loss vent line emissions would bias the Phase I system results towards failure. This bias was attributed to the standing losses that readily occur on single-wall ASTs when heated by the sun. Factors contributing to the standing losses were not considered when TP-201.1 was originally written and applied to ASTs. Based on testing conducted by ARB staff, ARB staff will propose a new test procedure, TP-206.4, Volumetric Efficiency of Phase I Vapor Recovery Systems for Aboveground Storage Tanks, which would be used exclusively for certification testing of Phase I systems installed on ASTs. This proposed test procedure would include steps for determining baseline standing loss at the vent line prior to delivery. This baseline would be used to correct standing loss that occurred during and after delivery to AST. No change is proposed for TP-201.1, the procedure used to determine the volumetric efficiency of Phase I systems installed on USTs.

Attachment 1

South Coast
Air Quality Management District
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(909) 396-2000 • www.aqmd.gov

Office of the Executive Officer
Barry R. Wallerstein, D.Env.
909.396.2100, fax 909.396.3340

July 23, 2013

Mr. Richard Corey
Executive Officer
California Air Resources Board
1001 I Street,
Sacramento, California 95814

Dear Mr. Corey,

The South Coast Air Quality Management District (SCAQMD) staff appreciates the opportunity to submit comments on the proposed amendments to certification and test procedures for Vapor Recovery Systems at Gasoline Dispensing Facilities (GDFs) and cargo tanks. Specifically, this submittal addresses the proposal to amend test procedures as specified under TP-201.1 – Volumetric Efficiency for Phase I Vapor Recovery Systems. SCAQMD staff requests the Air Resources Board (ARB) to delay adoption of the proposed amendment and direct staff to work with local air districts to develop an alternative protocol that will exclude the bias that can be experienced when testing single-walled aboveground storage tanks (ASTs).

As required by CP-206 - Certification Procedure for Vapor Recovery Systems at Gasoline Dispensing Facilities Using Aboveground Storage Tanks, Phase I Enhanced Vapor Recovery (EVR) systems must achieve a minimum volumetric control efficiency of 98 percent as determined by TP-201.1. Based on information provided in the ARB report, about 5,000 single-walled ASTs will need to be retrofitted with Phase I EVR system. This represents 70 percent (5000/7150) of all the AST that will need to be retrofitted. Any changes in the testing method that could result in inaccurate results in TP-201.1 method will directly impact the control efficiency of certified system installed on these single walled ASTs, and will in turn result in emission increases due to lower achieved efficiencies.

Under the current test method, vapor displacements from an AST are measured at the two possible venting routes—vapor return line to the delivery truck and the pressure relieve valve installed in the vent line of the AST throughout the delivery process and after the delivery process has ended until no more venting occurs. The purpose for measuring any vented volume after delivery has ended is to capture all venting due to any pressure build up within the storage tank. The proposed amendment seeks to stop the measurement right after the delivery process has ended. Doing so would ignore any pressure built-up in the storage tank due to the delivery and would almost always guarantee a passing certification test. A better approach can be to add to the current procedures ways to measure other vented volume that would otherwise occur separate from the fuel delivery process. At the time of evaluation, the extra vented volume can then be discounted to determine the full impact of the delivery process and the actual volumetric efficiency of the system being tested.

SCAQMD staff has already been in discussions with ARB staff to investigate and develop appropriate procedures to further refine an alternative proposal. SCAQMD staff is prepared to assist ARB staff in further development of an alternative proposal.

Clerk of the Board Air Resources Board July 23, 2013

Thank you for the opportunity to help improve certification protocols for vapor recovery systems. Please contact Mr. Mohsen Nazemi, Deputy Executive Officer at (909) 396-2662 or Mr. Danny Luong, Senior Enforcement Manager, at (909) 396-2622, if you need additional information or have further questions.

Sincerely,

Barry R. Wallerstein, D.Env.
Executive Officer

cc: Members of the Board