BAY AREA AIR QUALITY MANAGEMENT DISTRICT

July 21, 1998

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California Environmental Protection Agency
Air Resources Board
P.O. Box 2815
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RECOMMENDATIONS FOR PHASE II BOOTLESS NOZZLE SYSTEMS PROBLEMS

Dear Mr. Morgester: Jim

On April 1, 1998 the Bay Area Air Quality Management District submitted recommendations to minimize excess emissions from bootless nozzle Phase II systems. Due to the ongoing cooperative efforts to achieve this goal, the following revised recommendations are being submitted. Recent data collected by the Bay Area Air Quality Management District (BAAQMD) shows there are six primary causes of the low air to liquid (A/L) ratios, and corresponding inadequate collection efficiency, of bootless nozzle systems:

(1) liquid gasoline in the vapor return hose and dispenser piping,
(2) dispenser manifold piping configurations that cause liquid gasoline to "swap" from hose stem to hose stem,
(3) air leaks into the OPW 11VAI nozzles at the external vapor passage, spout lock nut, or vapor check valve,
(4) seepage of gasoline at the spout/nozzle connection of the OPW 11VAI nozzles,
(5) kinking of the inner vapor return hose on the "Curly-Q" hose configuration, and
(6) vacuum assist dispensers that continue to dispense gasoline with non-operational vacuum pumps.

The primary goal of the following suggestions is to improve the overall performance of these vacuum assisted Phase II systems in a cost-effective manner. If implemented, the following recommendations will improve the emissions reductions of these systems.

I. SHORT-TERM ACTION ITEMS

(A) DECERTIFY THE ALUMINUM-SPOUT OPW 11VAI NOZZLE WITH THE EXTERNAL VAPOR PASSAGE.

This decertification should prohibit the installation of any "new" aluminum-spout OPW 11VAI nozzles utilizing an external vapor passage and allow those nozzles in current service to be retained, including maintenance to replace the spout assemblies and external vapor passages, until nozzle replacement is necessary, or for a period of four years. Replacement vapor passages and spout assemblies should be supplied by OPW, at cost, to maintain existing nozzles for the four year period, provided that a bag test be used by dealers to verify

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nozzle integrity on a three month frequency. Attached is an example of the Bag Test InspectionProcedure developed by the BAAQMD. All spout replacements should be the modified stainless spout originally certified with the bootless systems.

This decertification is justified on the following basis:

1) Deformed spout tips in violation of 40 CFR Part 80 (Section 80.22(f)).
2) Leaking external vapor passages
3) Leaks at the nozzle lock nut
4) Leaks at the spout/nozzle O-ring.
5) Missing or misaligned spout latching springs.
6) Gasoline spraying from vapor collection holes, nozzle/spout interfaces, and shutoff aspirator ports.
7) Loss of vapor/liquid integrity at the plastic insert in the spout tip.

It is important that any nozzle submitted to CARB for certification undergo through evaluation and testing, including the "durability" test for a minimum of 90 days. A failure of any combination of the nozzle components, or failure to meet a performance specification during this 90 day test, exceeding five percent of the number of nozzles at the test site should be considered a failure of the test.

CARB should require that the spout tips be checked for compliance with the 0.840 inch OD federal specification on a quarterly basis. Spouts that are in violation of this federal statute should be replaced by OPW, at cost, with the stainless steel spout originally certified with the OPW 11-VAI nozzle.

(B) DECERTIFY THE "CURLY-Q" HOSE CONFIGURATION ON ALL DISPENSERS. IF THE INNER HOSE IS A HARD-PLASTIC OR NYLON-12 MATERIAL, PERMANENT KINKING CAN OCCUR. IF A SOFT INNER HOSE IS USED, TEMPORARILY KINKING CAN OCCUR IF A MOTORIST STRETCHES THE HOSE TO REFUEL ON THE "WRONG" SIDE OF THE CAR.

Prior to recertification of this configuration, a modified hose retractor clamp should be evaluated that would both reduce stress on the hose and reduce the achievable radius of curvature to a point where kinking will not occur. CARB should review certification records to determine which of the bootless systems were actually certified with this configuration. It appears that the WayneVac system was not certified with this hose configuration.

(C) REQUIRE ALL WAYNE DL SYSTEM MANIFOLDS THAT ALLOW THE SWAPPING OF LIQUID FROM HOSE STEM TO HOSE STEM BE REPLACED WITH A CARB-CERTIFIED, AND THOROUGHLY TESTED, RETROFIT KIT. THIS REPLACEMENT SHOULD ALSO INCLUDE ANY WAYNE VISTA DISPENSERS THAT HAVE THE SAME MANIFOLD DESIGN THAT PERMITS SWAPPING OF LIQUID.

The "swapping" effect transfers liquid trapped in one hose vapor passage to another and creates low A/L ratios as the vacuum pump clears fluid from the hose being used during a refueling event. CARB should require a recall of all current DL retrofit kits possessing this inadequate manifold design and stipulate that these kits cannot be sold in other states. The effects of the increased "Pressure Inventory" caused by smaller diameter piping needs to be evaluated prior to certification. Also, the reduction in inside diameter to 0.5 inches needs to be evaluated for possible negative impacts in cases where the dealer wants to change back

to balance systems because of incompatibility of vacuum assist with ORVR systems. The dispenser plumbing should be compatible with all Phase II systems. This prohibition should also include any liquid traps on the piping between the dispenser outlet casting and the vacuum pump.

(D) REQUIRE A RETROFIT OF ALL DISPENSERS WITH ADEQUATE HARDWARE/SOFTWARE TO MEET CARB REQUIREMENTS THAT DISPENSERS NOT DISPENSE GASOLINE IF THE VACUUM PUMP IS NON-OPERATIONAL.

This completely uncontrolled source of emissions in unacceptable, and will continue to worsen as vacuum pumps in current service approach their designed useful life expectancy. Again, any recall of existing components should stipulate they cannot be sold in other states.

(E) REQUIRE THE "BAG TEST" TO VERIFY THAT NOZZLES ARE NOT INGESTING AIR INTO THE VAPOR PATH. THIS REQUIREMENT SHOULD BE INCLUDED IN THE APPLICABLE EXECUTIVE ORDERS

The Bay Area has been able to identify non-complying A/L ratios between 0.32 and 0.84 using the bag test. An outreach program to work with dealers and trade associates on how to properly conduct a bag test would be beneficial. Retest data from the Bay Area demonstrates that the bag test should be conducted on a minimum frequency of every three months.

Static pressure testing cannot detect many of these leaks at the nozzles. The standing column of liquid gasoline that is typically found in these hoses will mask this leak in systems utilizing a nozzle with an integral vapor check valve. This is because a pressure on the back side will only raise the column of liquid, not allow the leak to be found. On systems such as the Gilbarco VaporVac, the static pressure test cannot determine leaks in the hanging hardware due to the use of a solenoid check valve.

To minimize emissions caused by testing, it is critical that no district allow the pressurization of the storage tank headspace over the pressure setting of the Pressure/Vacuum (P/V) valve. One of the causes of failures of the external vapor passage in the OPW 11VAI nozzle was the large pressures exerted on the vapor passages due to liquid in the hose. If the hose has liquid all the way to the 0.75 inch ID piping in the dispenser head, introduction of a pressure for testing that exceeds the maximum allowed by the P/V valve may damage the nozzles, creating leaks that will ingest air into the system. In no case should a pressure greater than that created by the 3 inches H_2O pressure side of the P/V valve be used for testing. CARB should ensure that it's static pressure test prohibits the removal of the P/V valve for the purpose of over-pressurizing the system.

(F) CARB SHOULD REQUIRE A SYSTEM-SPECIFIC MAINTENANCE LOG AT EACH GDF.

This log should not be generic to all systems, but must be specific to the system at the GDF. This log should be required in the applicable Executive Order and should be developed by the "owner" of the Executive Order as a supplement to the Installation and Maintenance Manual already required by CARB certification procedures. This log will provide data on failure rates of specific pieces of equipment and could also be used by the dealer to demonstrate due diligence.

(G) PROHIBIT PHASE I DRAIN VALVES ON NEW INSTALLATIONS OF ALL VACUUM ASSIST PHASE II SYSTEMS.

Leaks that allow emissions from these drain valves have been shown to develop within several months of operation, regardless of how leak tight they are upon initial installation. Water Quality regulations allow the absence of these drain valves provided that a means of removing gasoline from the Phase I containment box is available. A good option is a gasoline-compatible hand-pump to be required both on-site, and in each gasoline cargo tank.

(H) REQUIRE THAT THE MANUFACTURER THAT "OWNS" EACH EXECUTIVE ORDER APPROVE THE ADDITION OF ANY HANGING HARDWARE PRIOR TO INCLUSION INTO THEIR EXECUTIVE ORDER.

In addition, provisions should be made to allow a company to have components removed from their Executive Order if they can provide data showing an unacceptable failure rate of such components. This would help reduce the installation of non-effective components in the future.

(I) REVISE THE EXECUTIVE ORDERS TO REQUIRE ANY REPAIRS AND REPLACEMENTS NECESSARY TO SUCCESSFULLY CONDUCT THE START-UP AND ANNUAL A/L AND STATIC PRESSURE TESTS BE SUBMITTED TO THE LOCAL DISTRICT WITH THE FINAL TEST RESULTS.

This will allow the local districts to collect data, in conjunction with CARB, to improve performance of the components.

(J) INCLUDE A "PRESSURE DROP INVENTORY" INTO EACH APPLICABLE EXECUTIVE ORDER. THIS WOULD PROVIDE A NECESSARY COMPONENT MATRIX TO BOTH THE PETROLEUM MARKETING INDUSTRY AND LOCAL DISTRICTS. THIS MATRIX WILL PROVIDE A MEANS FOR PROPER SELECTION OF COMPONENTS THAT WILL NOT ADVERSELY AFFECT THE PERFORMANCE OF THE SYSTEM.

Different pressure drops through system components can adversely affect the ability of the bootless systems to maintain an acceptable A/L ratio during refueling events.

(K) REQUIRE NEW INSTALLATIONS OF BOOTLESS PHASE II SYSTEMS TO (1) MANIFOLD STORAGE TANK VENTS TO A SINGLE P/V VALVE AND, (2) USE A SINGLE STEM DISPENSER CONFIGURATION.

The emissions of pressure-related fugitive emissions can be minimized by reducing the number of potential leak sources at gasoline dispensing facilities. Reducing the number of P/V valves on storage tank ventpipes from three to one, and the number of nozzles from six per dispenser to two can significantly reduce the emissions of gasoline vapors. This reduction is the number of possible emission sources will also facilitate self-inspection programs currently used by some dealers.

II. LONG-TERM ACTION ITEMS

(A) ENFORCE THE 100 PERCENT FACTORY TESTING OF NOZZLES, AS SPECIFIED IN THE EXECUTIVE ORDERS.

This proposal is necessary both for the protection of California businesses from buying bad equipment and to reduce the fugitive VOC and toxic emissions caused by pressure in underground storage tanks. In addition to the tests for nozzle shutoffs, the bootless nozzles should also be 100 % factory tested for (a) pressure vs. vacuum and (b) static pressure integrity, specifically at the spout/body interface and vapor check valve. This would decrease required enforcement action against the operators by decreasing the percentage of non-A/L complying nozzles installed at Gasoline Dispensing Facilities (GDF). The two most effective means to verify compliance with the 100% factory testing provisions would be (1) visit the factories and (2) audit the part-houses in California and check new equipment for compliance with the performance specifications.

(B) INCLUDE A ONE PAGE SUMMARY OF TITLE 17 DEFECTS IN EACH APPLICABLE EXECUTIVE ORDER.

State law mandates that only the state board shall identify those defects which substantially impair the effectiveness of the system and are subject to being tagged "Out of Service" (ref:Section 41060.2(c), CH&SC). Additional recommendations on the Title 17 topic are for CARB to prepare, workshop, and submit to their board for approval, a new generic Title 17 list. The existing list is 17 years old and does not address many of the systems and components currently in use. This has necessitated interpretations, by both CARB and the local districts, as to the applicability of the state-mandated "tagging" requirement (ref:41960.2(d), CH&SC) to a specific defect. Reestablishing this list will provide consistency throughout the state and help protect the affected businesses by allowing them to factor in the enforcement requirements, of the various Phase II systems, into their final decision for system selection.

(C) ALLOW THE LOCAL DISTRICTS A FIFTEEN DAY REVIEW PERIOD PRIOR TO THE ISSUANCE OF NEW EXECUTIVE ORDERS.

Acceptance of this proposal would result in the dual benefits of providing the local districts the necessary lead time to integrate the new components, or systems, into both their Permit and Enforcement policies. This review period would be a tremendous aide in the Permit streamlining effort and provide adequate time for training of local inspectors. It also would provide CARB with comments on issues of clarity, and intent, prior to the formal issuance of the Executive Orders.

(D) DEVELOP A "SUMMARY OF CERTIFICATION" DOCUMENT TO BE INCLUDED WITH EACH EXECUTIVE ORDER.

Section 41954 of the H&SC specifies the mechanism to obtain certification. If all of the procedures in the CARB test procedures are followed, the systems will perform properly. CARB should supply a "Summary of Certification Process" document with each Executive Order. This summary should clearly document that all phases of the process, from application through efficiency testing were successfully completed.

(E) INCLUDE, IN THE EXECUTIVE ORDER, A SUMMARY OF ANY "CRITICAL" MAINTENANCE REQUIRED FOR THE SYSTEM OR COMPONENT.

This would provide the operator of the facility the necessary information to minimize periods of non-compliance. As an example, if the system manual recommends that the main blower for a vacuum assist system be rebuilt every five years, this requirement should be prominently displayed within the Executive Order. It would also benefit the permitting of these systems by providing the local districts with appropriate bases for applicable conditions to help protect the owners of these facilities.

(F) LIMIT THE EFFECTIVE LIFE OF CERTIFICATIONS TO FOUR YEARS.

Historical experience with the certification process has demonstrated the problems with open-ended certifications. Inclusion of this certification limitation should entail an engineering evaluation at the end of each four-year period. If difficulties have been encountered with a specific system, CARB would have the authority to require the necessary manufacturer-based modifications for future systems without having to decertify existing systems. This would decrease future emissions by requiring systems to include those state-of-the-art advancements which promote increased in-use effectiveness. It would also minimize the financial impact on small businesses by decreasing the necessity for full decertifications. If there have been no problems encountered during the previous four years, the certification would be reissued.

(G) REQUIRE A START-UP AND ANNUAL TEST OF CARB-REQUIRED MONITORS FOR THOSE BOOTLESS PHASE II SYSTEMS WHERE FAILURE OF A SINGLE "CRITICAL" COMPONENT WILL CAUSE A LARGE DEGRADATION OF THE EFFICIENCY FOR THE ENTIRE FACILITY.

Some bootless systems have a critical component(s) that results in large Phase II efficiency degradation for the entire facility if the component fails. In recognition of this, CARB has required monitors for these systems. Title 17 and the CH&SC require local districts to "tag" all nozzles affected by a "significant" defect. If the CARB-required monitor does not properly notify the dealer, the result will be that entire facilities are tagged "Out of Order." This is an unacceptable burden on business and results in elevated levels of emissions, including toxic compounds, during these non-complying episodes. It is recommended that CARB require both start-up and annual verification tests to ensure the CARB-required monitors function properly. Current bootless Phase II systems recommended for this mandatory start-up and annual verification test of their monitors are: (1) Healy system employing a single collection unit, (2) Hasstech system, and (3) Hirt systems. Engineering evaluation should provide the basis for the procedure to simulate a failure during this necessary start-up and annual verification procedure.

(H) CARB TEST PROCEDURES SHOULD BE MODIFIED AS FOLLOWS:

1) TP-201.3. Disallow the removal of a P/V valve for the purpose of imposing a pressure on the storage tank headspace in excess of the maximum setting of the P/V valve. Any pressure over the P/V valve setting is unnecessary and can damage some of the hanging hardware, specifically the external vapor passage on the OPW 11-VAI nozzle.

2) TP-201.5. Require the "bag" test as a troubleshooting aide in conjunction with the A/L test. This will help ensure that A/L ratios have not been increased to compensate for a leak in the nozzle. In addition, TP-201.5 should require a single run of between 4.5 and 5.0 gallons to reduce emissions associated with the performance of this necessary test. If the A/L ratio on the first test is outside of the allowable range by 0.1 or greater, the test is over and non-compliance has been determined. If the A/L after this single run is outside of the allowable range by less than 0.1, two additional runs shall be conducted and the arithmetic average of the three runs will determine the compliance status.

If you have any questions on any of these recommendations, please contact James Guthrie, Director of Compliance and Enforcement, at (415) 749-4787. I look forward to working with you to improve the performance of these systems in a cost-effective manner.

Sincerely,

Pete Hess, Deputy Air Pollution Control Officer

Attachment

cc: Thomas Cackette, Deputy Executive Officer, California Air Resources Board
Richard Sommerville, APCO, San Diego County APCD

Inspection Procedure **GDF-01**

Gasoline Dispensing Facilities

BAG TEST FOR MULTI-NOZZLE VACUUM ASSIST SYSTEMS

1. PURPOSE

1.1 This inspection procedure provides a method to determine if "bootless" vacuum assist vapor recovery nozzles allow air ingestion into the vapor recovery system which degrades its performance during vehicle refueling. The procedure can also isolate the source of air leakage. It can be used on dispensers that have three nozzles on each side with built-in integral check valves.

2. PRINCIPLE

2.1 A plastic bag is placed over the nozzle and sealed around the hose at the base of the nozzle. The bag is observed while another nozzle on the same side of the dispenser dispenses at least 2.5 gallons of fuel into a vehicle. If the bag shows a definite collapsing during the dispensing event, there is a leak in the bagged nozzle causing ingestion of air into the vapor recovery system. Ingestion of air will reduce nozzle vapor recovery effectiveness and increase gasoline evaporation in the system.

3. INTERFERENCES

3.1 If the vapor recovery vacuum pump is not operational, this procedure will not detect a leaking nozzle.

3.2 If the vapor passage of the hose has a column of gasoline larger than the vacuum capabilities of the vacuum pump, a leaking nozzle may not be detected.

3.3 Some models of dispensers cannot set the price-per-gallon if more than one nozzle is removed from the dispenser holster. Wait until the price has been set before removing the nozzle to be tested.

3.4 The nozzle being tested and the nozzle dispensing fuel must be connected to the same common vapor piping and vacuum pump.

3.5 This procedure cannot be used on single nozzle dispensers or passive systems such as a balance system.

3.6 Any holes in the bag will bias the test procedure to indicate compliance.

4. EQUIPMENT

4.1 **Bag**. Use a polyethylene plastic bag large enough to enclose the entire vapor recovery nozzle. Recommended sizes for a polyethylene bag are 10 to 12 inches in width and 18 to 20 inches in length. The bag should be at least 1.5 mils thick, but not greater than 4 mils thick. Bags that are too thin will tend to break while bags that are too thick may tend to mask a leak in the nozzle.

4.2 **Data Sheet**. Use a data sheet to keep track of which nozzles have been tested. This data sheet will help ensure and verify that all nozzles have been checked on a routine basis. An example of a data sheet is shown in Figure 3.

5. INSPECTION PROCEDURE

5.1 Visually inspect the polyethylene plastic test bag to verify it has no holes. After product flow from one of the nozzles into a vehicle has been initiated, pick up one of two nozzles not being used and carefully place the entire nozzle into the plastic bag. Avoid tipping the nozzle spout downward, which may cause spillage of gasoline. Once again, visually inspect the test bag to ensure no holes were caused by inserting the nozzle. Ensure that some air is in the bag and use your hand to provide a tight seal between the bag and the nozzle/hose connection. See Figure 1. Watch the bag for signs of collapse. If the bag does not show a definite collapse due to air being removed after 2.5 gallons, remove the nozzle from the bag, hang it back up on the dispenser, and check the other idle nozzle.

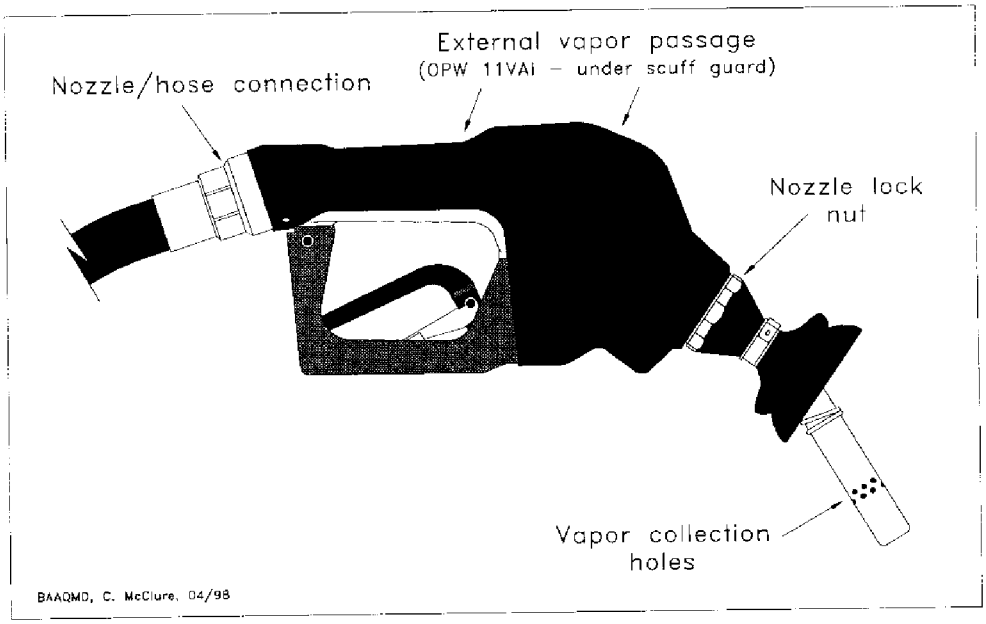
FIGURE 1
Bag and Nozzle

5.2 If the bag collapses, it verifies that there is air leaking into the nozzle. The following additional tests may be done to determine where the leak is occurring:

5.2.1 Use your hand to seal the bag on the nozzle body just below the nozzle lock nut. Make sure some air is in the bag to start. If no collapse of the bag is observed, the leak is probably through the nozzle vapor passage. If the bag does

collapse, use your hand to seal the bag just below the spout's vapor collection holes. Again make sure that some air is in the bag. If the bag collapses when sealed below the vapor collection holes, the leak is probably at the nozzle's vapor check valve. If the bag fails to collapse after being sealed just below the spout vapor collection holes, the leak was probably at the nozzle lock nut. See Figure 2 for illustration of nozzle components.

FIGURE 2
Typical Nozzle Components



5.3 Record the presence or absence of leaks on the data sheet. Retain this data sheet as a record of which nozzles have been tested for leaks, corrective actions taken and re-tests performed.

5.4 Replace the nozzle component that caused the leak or, If the leak was caused by the nozzle vapor check valve, replace the nozzle. After replacing defective components or the nozzle, retest the new or repaired nozzle as outlined in this procedure.

5.5 To check all three nozzles on the side of a dispenser will require at least two vehicles refueling with different product grades.

6. RECORDING DATA

6.1 Results of the bag test should be tabulated on a data sheet to provide a record of nozzles checked and a reminder to take corrective action to fix leaks found.

6.2 Routine bag testing will help minimize the emissions of gasoline vapors and reduce evaporation of liquid gasoline.

FIGURE 3
BAG TEST DATA SHEET-INSPECTION PROCEDURE GDF-01

STATION NAME _____ ADDRESS _____

CITY _____ PHONE _____

DISPENSER MODEL # _____ NUMBER OF NOZZLES _____

PUMP #	GAS GRADE	NOZZLE BRAND	NOZZLE SERIAL #	NOZZLE LEAKS [Y/N]	LOCATION OF LEAK	CORRECTIVE ACTION	DATE REPAIRED
1	87						
1	89						
1	92						
2	87						
2	89						
2	92						
3	87						
3	89						
3	92						
4	87						
4	89						
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TEST CONDUCTED BY _____ DATE _____