SUMMARY OF COMMENTS RECEIVED ON P/V VALVE SPECIFICATIONS

April 19, 2005

Following are comments received regarding the proposed cracking specifications for P/V vent valves. The comments were submitted in response to the ARB's January 31, 2005 letter to Phase I and II EVR stakeholders. Comments were received from ten groups.

Support Changing the Specifications:

1) Vapor Systems Technologies, Inc.; (Glenn K. Walker, 2/28/05 Letter); "Vapor Systems Technologies (VST) is pleased to submit comments with regards to the cracking pressure issue of pressure/vacuum vent valves.

   VST's experience/data collection indicates that GDFs continually leak for various reasons. Due to these findings, VST feels that the minimum positive cracking pressure range should not be increased. Our data taken from an underground storage tank (UST) demonstrates that when internal positive pressure increases, leak flow rates increase. (See attachment - UST System Pressure vs. Vapor Flow Rate.) This phenomenon indicates a trend towards fugitive emissions.

   Data for this chart was created by connecting a digital pressure sensor to an underground storage tank fill pipe, similar to TP201.1, Figure 2- Storage Tank Pressure Assembly. A flow meter was attached to a "valve/tee assembly" near a vent riser. The initial tank pressure was recorded at zero flow. The valve to the flow meter was opened so as to measure flow rate (cfm) and pressure readings (in. WC). This test demonstrated that increased pressure in an UST produces a non-linear increase in vapor flow rates.

   VST recommends reducing the negative performance specification (i.e. - from –8 to –19 inches H_2O as suggested), so as to create a more optimal performance situation. We have consistently stated that managing UST pressures below atmospheric levels will eliminate any opportunity for fugitive emissions.

   In addition, VST recommends the cracking pressure of pressure/vacuum vent valves performance specifications be adjusted to:

   Minimum positive cracking pressure 3 inches H_2O

   Maximum positive cracking pressure 7 inches H_2O

   Minimum negative cracking pressure -19 inches H_2O

   Maximum negative cracking pressure -8 inches H_2O"

2) OPW; (Pete Manger, 2/23/05 Letter); “As you already know OPW is currently testing Pressure/Vacuum valves with new cracking values. These valves are the latest version that we have been working on for several years. OPW has been manufacturing P/V vents for over 20 years and has seen the allowable leak rate get smaller and smaller. Each time the leak rate was reduced OPW had to change its method of sealing the valve but still hold the same cracking values. Each time the leak value is reduced it makes it that much harder to have the valve open at a specified range. With the latest EVR requirements the leak values have gotten so small that it has greatly affected the ability to crack open the valve in the specified range. CARB has also change the method in determining the cracking values over the years with each change it has gotten harder and harder to meet the requirement. OPW has spent a lot of time and money looking into ways to get the latest design to not only meet the current leak values but also the crack values. This is a very challenging task to design something with next to no leak that is exposed to a very harsh environment that also need to open at a value very close to the test leak pressure and maintain this performance over the life of the product.

   During a design or trouble shooting process we try to look at everything that has to do with the product or problem. This led us to ask why are the cracking values being held to such tight requirements. We understand the reason for reducing the leak values reduces the vapor emissions. It can also be stated that by increasing the cracking values you will also reduce the vapor emissions. After several discuss with people who have worked on this product over the years no one could come up with a reason for the current cracking values. OPW spoke with some tank manufactures to determine if increasing the cracking values would create any issues with the tanks. According to UL 58 and UL 1746-Part 3 the tanks are to be tested to 5.0-psig pressure with a safety factor of 5:1. We got several verbal statements from tank manufactures where the test vacuum was anywhere between 7.0 in-Hg (3.43 psi) to 11.5 in-Hg (5.64 psi). From these values the test pressures for the tanks are a lot larger than the cracking values of the P/V valve. Based on these discussions and the need to make the P/V valve more reliable OPW requested the cracking values to be changed to the suggested positive pressure of 2.5 to 6.0 inches-H_2O and a negative pressure of 6.0 to 19.0 inches H_2O. “

3) Husky; (Arthur C. Fink, Jr., 2/22/05 email); “Husky Corporation agrees with the proposed change of the pressure cracking pressure from a maximum of 3.5 inches to 6.0 inches wc. This will help to reduce leaking at the 2 in wc leak rate test. This increased cracking pressure will also reduce fugitive emissions during bulk drops that result in system pressures that reach the current 3 inch wc cracking pressure. Lower cracking pressures may in some cases improve the collection efficiency at the vehicle nozzle interface but when the PV vent opens you are loosing vapors.

The current vacuum cracking pressure of 6 to 10 inches wc is already much easier to achieve then the pressure cracking pressure of 2.5 to 3.5 inches wc due to the 2.6 times higher pressure and 4 times the range. The higher the allowed vacuum cracking pressure the greater the error when using the stick method to check the tank level. Systems with only Stage I vapor recovery operate at the negative cracking pressure at all times because fuel is being removed without any vapor return. The maximum of 19 inches wc seems excessive, a small increase, say to 12 inches wc, would help manufacturing with minimum effect on the tank gauging.

The fire safety codes tests use pressures of at least 2.5 psi, 69 inches wc, for both pressure and vacuum for USTs, however some manufactures of vertical above ground tanks with flat top ends do not design for any vacuum just for snow load, so they would like to have free venting.

It would help with the field testing if you would change the cracking pressure test procedure, TP-201.1E, to apply the pressure slowly up to the flow rates specified, more like the normal rate of pressure change in a system. The peak pressure observed will give an accurate reading of the maximum cracking pressure of the valve. If the valve passes the allowable leak rate test it meets the requirement for minimum cracking pressure. Make the change:

2.5 to 6 inches wc for the cracking pressure
6.0 to 12 inches wc for the negative pressure."

4) Triangle Environmental, Inc.; (Roy Soffe, 2/21/05 email); 'Thank you for the opportunity to comment on the proposed changes to the cracking pressure requirements for P/V valves as specified in CP-201.

   We appreciate that ARB is considering the change to better reflect the actual field performance of the valves in question. We assume that the required leak rates would not change, i.e. 0.05 CFH @ 2.00 WCI and 0.21 CFH @ -4.00 WCI, and that the proposed change is to allow valve manufactures a greater opportunity of meeting these leak rates without exceeding cracking pressures. Manufacturers could use stronger springs or heavier poppets to achieve the leak rates without being constrained by small cracking pressure ranges, which at this time are 1.00 WCI, ((0.05), and 4.00 WCI ((2.00).

   We would suggest that the required cracking pressures be set at: 4.00 WCI (2.00 positive, and -12 WCI (6.00 negative, which would increase the ranges to 4.00 WCI, ((2.00), and 12 WCI, ((6.00), we believe these values would greatly assist manufacturers in achieving the desired leak rates which have been historically extremely difficult to achieve."

5) Franklin Fueling Systems; (Gary J. Saltz, 2/3/05 Letter); "Thank you for the opportunity to allow EBW to add input to your decision to change the minimum levels of performance specifications for P/V valves. EBW supports

the changes in the positive pressure setting and the levels for the negative pressure setting. If the change is accepted EBW will continue to manufacture and test our P/V vent to the current standards."

6) R.S.S.E. Inc.; (Larry Foster, 2/4/05 email); "As a Petroleum maintenance and testing company we feel changing the allowed PV Valve cracking pressures would be a positive change. This change should allow for more realistic "real world" readings. Presently fairly new PV Valves are found to be VERY slightly out of compliance and need to be changed. This regulation change would allow the PV valves to enjoy a longer usable life. This change could also well have the effect of keeping the PV Valve costs under control by allowing the manufacturers more leeway in testing and production.

7) Tehama County APCD; (Joe Sunday,2/3/05 email) "Tehama County is in favor of the new cracking pressure specifications ARB is considering. It is our understanding that no damage would be done to vapor recovery systems using the suggested limits."

Opposed to Changing the Specifications:

8) Hazlett Engineering; (Wesley W. Hazlett, 2/25/05 Letter); "Reference is made to your letter of January 31 relating to vent valve specifications. We strongly recommend that no change to the tolerances be made."

   Any pressure or vacuum in the underground tank has an influence on the efficiency or safety of other ancillary components in the overall refueling apparatus such as the nozzle, the tanker truck, vapor pumps and the auto vapor handling mechanisms. Some of the effects are substantial when the level of pressure or vacuum is high.

   The response time of the nozzle cut-off is progressively delayed in the presence of increased pressure with the result of increased wetting of the boot. In the presence of negative pressure premature cut-off occurs which induces repeated attempts to fuel. In the extreme the cut-off sensing circuit is flooded and uncontrolled fuel flow occurs.

   Hazlett Engineering introduced the first simple closed system Stage II vapor control and biased pressure option in 1974. There was no CARB and the criteria for the containment range were selected to be plus 4 and minus 6 inch WCG. The negative limit was based on a computer generated model made by Bay Area public health officials which showed dramatic degradation of Stage I efficiency if the tank truck PV valve is cracked. This is more likely to occur when existing vacuum is augmented with transient effects associated with transfer of fuel from a small container to a large empty one in a closed system.

These limits were modified to plus 3 and minus 8 by mutual agreement with CARB, Bay Area pollution authorities and Hazlett in mid 1980 when CARB directed modification of the balanced system to include a PV valve.

Strong negative pressure can act on minor leaks at the nozzle and the return conduit to homogenize and dilute the contained vapor to explosive range. I have observed three different service station explosions on FOX TV last summer. All appeared to initially involve the conduit and not the auto tank. If you consider that very few stations have a camera on the very site of the accident authorities should be alarmed.

The liquid seal design of most ORVR tanks is a column of fuel supported by a spring valve at about 6 inch WCG. If a tight fit nozzle coupling a tank with 15000 gallon ulage and a pressure in excess of the spring tension one could anticipate a reverse flow of vapor greatly in excess of the capacity of the auto carbon canister and a permanently disabled system which is unlikely to be discovered.

Even the vapor pumped system with loose fit nozzles will have trouble modulating vapor flow with the range of pressure deviation that you have observed.

Tight fit push-pull systems require a limited amount of negative pressure to function most efficiently. With the advent of ORVR the demand for ingested air is more than enough for that degree of vacuum. That excess demand should be relieved at the PV valve to prevent adverse influence on ancillary components.

It is recommended that no changes in the present standards and permissible deviation be allowed. See our disclaimer on ORVR compatibility at www.hazletteng.com"

9) Steel Tank Institute; (Lorri Grainawi, 2/28/05 email); "I am (responding) in regards to the CARB proposal to change the pressure specifications for pressure/vacuum valves. I am curious as to why CARB is proposing this change. From the notice, it appears that this change is not expected to improve air emissions. If that's the case, why make this change?

STI has some concern over the proposed level of vacuum, 19" water, that could be placed on the primary tank. STI did considerable research regarding underground steel tank buckling pressure from about 1990 - 1996.

Using the formulas derived from this research, STI's conclusion is that while it is not likely for a steel tank to buckle from the vacuum level proposed, under the right set of conditions, there is a possibility that 19 inches of water column could cause a steel tank to fail structurally. Conditions under which a tank

could fail include high groundwater table, poor backfill conditions and a lower stiffness of the steel tank itself.

I'd like to add that "failure", in this case, is defined as the steel tank undergoing permanent deformation. Of the few steel tanks that I know of that have failed structurally for whatever reason, all continued to remain liquid tight and contain whatever product they were storing.

If you'd like more technical information, please let me know and I can send you the calculations from which this was derived."

No Preference Stated (i.e., in favor of or opposed to),

10) Fiberglass Tank and Pipe Institute; (Sully Curran; 04/04/05 email) "This is in response to your request on CARB's proposal to revise PV valves to 2.5-6.0 and 6-19 inches of water, positive and negative pressures, respectively.

The Fiberglass Tank and Pipe Institute represents Owens Corning, Containment Solutions, Cardinal and Xerxes fiberglass underground storage tanks. The foregoing CARB proposed PV valve settings are not a problem for existing or new tanks manufactured by the above listed companies. Please advise if we can provide additional information."