Proposed Amendments to Enhanced Vapor Recovery Regulations

5 May 2020 Workshop

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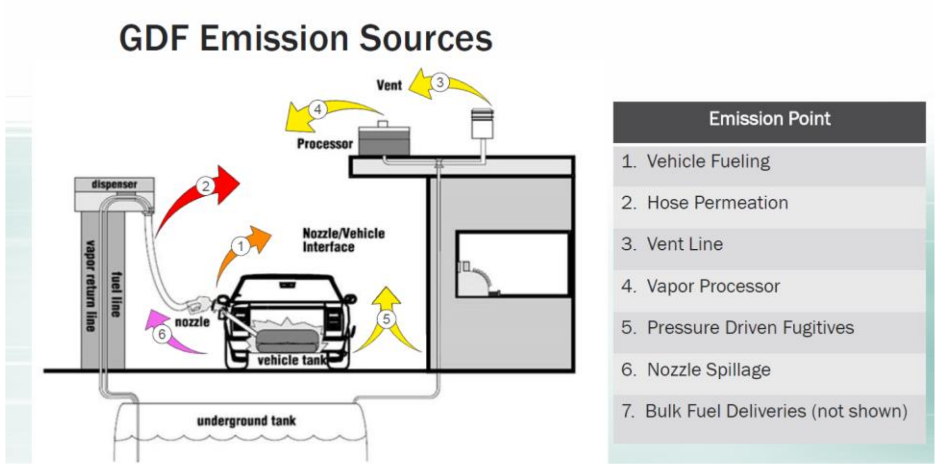
ARID appreciates the opportunity to comment further on the proposed amendments to the Enhanced Vapor Recovery Regulations. We would like to focus our comments on the proposed change to ISD software to eliminate Overpressure (OP) Alarms. We ask that our latest comments be included along with previously submitted comments dated 29 April and 23 April 2020. Those previous comments were submitted via email.

With reference to below schematic presented by ARB during the Workshop, we note seven emission points listed, and six vapor emissions points highlighted. As ARB realizes, the emissions shown can be categorized into **Refueling** Emissions and **Storage Tank** Emissions. The majority of the emissions from Refueling can be characterized by point 1, and these emissions are dependent primarily on ORVR and Phase II nozzle vapor recovery efficiency. The majority of the Storage Tank Emissions can be characterized by points 3 and 5 (neglecting for now, the presence of a processor), and are primarily dependent upon storage tank pressure, which in-turn is dependent upon fuel evaporation rate (and leak rate) within the combined storage tank ullage space. The total emissions from a given GDF must include the sum of the Refueling Emissions and the pressure related Storage Tank Emissions. Even if the “front-end” combination of Phase II and ORVR refueling technologies yields high vapor recovery efficiency, the loss of vapors from “back-end” storage tank emissions must be included in the overall vapor recovery efficiency. Even relatively small mass emission rates from the storage tanks can negatively impact overall vapor recovery efficiency.



ARID has attached to this correspondence a spreadsheet which was previously submitted before the ARB Workshop and has now been updated to reflect parameters used by ARB in their supporting technical information. The spreadsheet quantifies typical Refueling and Storage Tank Emissions from California GDF operating a Healy vac-assist Phase II "front-end" system in conjunction with a Healy CAS variable volume vapor collection bladder tank on the "back-end". (This variable volume tank has 400-gallon capacity). We used actual data collected from California GDF to accurately measure the pressure related fugitive emission factor (TP-201.2F) as well as the evaporative growth rate during winter and summer months. (ARID has collected detailed data from California GDF in conjunction with our latest certification work which was initiated in November, 2014 and prior to that, we gathered data from other sites from December 2002 through October 2006. In addition, more recently, we have been asked by Balance system GDF operators to collect data from several of their California locations).

ARB has access to directly measured data (from their data logger systems) as well as access to ISD data to make accurate calculations of the same metrics, without the need to model or estimate any parameters. ISD data presently includes tank pressure and ullage volume data from approximately 7,600 California GDF.

Before discussing details of the attached spreadsheet, I'd like to first summarize several fundamental observations regarding pressure related storage tank emissions:

- Air ingestion into the GDF ullage space is the root cause of fuel evaporation and volume growth
  - Air ingestion occurs at the vehicle nozzle interface **AND** at the PV vent
    - Front-end Phase II inefficiency
    - Operation at large negative pressure (vacuum) in the storage tank ullage over extended busy pumping periods
    - Mass balance is satisfied; less air in at nozzle; means more air in at PV vent
- Vent and Fugitive emissions can generate significant mass of VOC's and HAPS
  - The vent and fugitive emissions represent a very large percentage of the Unrecovered emissions from the Refueling vapor recovery system (Phase II and ORVR)

I'd also like to comment on the ARB finding that approximately 95% of ISD overpressure (OP) alarms do not identify a repairable equipment defect

- ISD Alarms not indicating equipment failures, per se
  - ISD Alarms indicate overpressure which is in-turn an indication of large fuel evaporation rates
  - The large evaporation rates are not adequately processed by existing, previously certified (pre-2019) EVR systems
  - The legacy systems suffer from fundamental design flaws; where vapor processing capacity is insufficient to handle the large volume rates
  - The overpressure alarms at certain higher throughput GDF seem to persist all year long, and are not only a problem during the higher RVP winter fuel season
  - Holiday shut-down periods which include extended time of no pumping activity tend to yield very significant pressure driven emissions, with high persistent volume flow at high hydrocarbon concentration (at or near saturation values)

- Many GDF operators have switched from the Healy assist system to the balance system as a means of mitigating OP alarms
    - Balance system GDF operators continue to experience OP alarms, even during summer RVP fuel season
        - ARID has been monitoring data from such high throughput balance sites
        - Even though there is no PWD, we do note significant off-hours pressurization, which reaches cracking pressure of PV valve, with a Healy CAS installed (This data is from one week ago, May 2020, which is summer RVP fuel. This data is available upon request)
        - The high throughput GDF operators (Assist and Balance sites) have been proactive, and they wish to understand details of the pressurization and to solve the problem at the root cause
            - Root cause is evaporation that increases tank pressure; the increased tank pressure triggers the ISD OP alarms, which in-turn indicate the presence of fugitive and/or vent emissions
- In 2019, a certified vapor processing system meeting the ISD pressure requirements has emerged. This system was used to replace Healy CAS buffer tanks.

The spreadsheet shows the technical derivation of the Storage Tank and the Refueling emissions; where both a summer and winter fuel evaporation rate are used to calculate an average annual figure. Next, the pressure driven fugitive and vent emissions are compared to both the Refueling *recovered* and *unrecovered* masses, where significant impacts are seen on recovery efficiency. In addition, a site emission factor is presented for various GDF throughput volumes. It should be noted that all of these emission factors exceed the CP-201 limit value of 0.38 lb/1,000 gal dispensed. Moreover, economics are presented for using a CARB certified processor to reduce the storage tank emissions; where the cost effectiveness is tabulated. It seems that historic cost effectiveness figures for the EVR program have ranged from $5 to $10 per pound of emissions reduced. The values shown for the ARID processor are compelling in comparison to historic figures. *(A negative cost per pound indicates a revenue per pound of emissions reduced).*

ARID's Questions to CARB going forward include the following:

- Should ISD be based on time at pressure or alternatively on a fugitive emission factor for a given site using the relationships in TP-201.2F
        - How were the original ISD pressure thresholds derived? …and on what basis?
    - Extensive pressure data already exist, and fugitive emissions data can be derived from the pressure data with simple ISD coding
- Regarding the CARB background technical reports and studies on Overpressure, who is the author?
    - Have these reports and studies been peer reviewed or studied by any outside, objective technical parties? (For example, University Professors or Public Health experts)
    - To derive general conclusions on a population size of 3,600 Healy Assist GDF from a sample size of 4 GDF seems like a big leap
- What are values for updated costs per pound for emissions reduced in the EVR program?
- How does the newly certified system compare to this cost?

- Given that a certified system now exists, what are the health impacts of relaxing the ISD pressure alarms in CP-201 (OEHHA Guidance Manual and Hot Spots Program)?
- OEHHA's Guidance Manual for Health Risk Assessments
  - Health Risk Assessments (HRA's) require average annual and maximum 1-hr emissions rates
    - Temporal variation of the emissions
      - Vent and fugitive emissions typically are generated during the "off hours"; as California GDF not exhibiting PWD are operating at deep negative pressures during busy pumping periods and excursions to positive pressure occur after shut down or when lower pumping rates are experienced
      - Vent and fugitive emissions 1-hr maximum values are much higher than daily average values
      - Holiday shut-down periods yield especially large several hour emissions intervals, where the emitted vapors are at saturation (high hydrocarbon) concentration levels

In summary, we'd like to state the following:

- CP-201 Proposed changes to ISD Pressure Alarms do not preserve emissions reductions that have been earned over many years of hard work by ARB, Air Districts and CAPCOA
  - GDF operators have invested heavily in the recommended hardware and software for the Enhanced Vapor Recovery Program
- Balance systems typically operate at modest vacuum levels (relative to Healy Assist System) and therefore require less time to exceed the buffer capacity of the storage tank
  - High throughput GDF using Balance system Phase II experience significant pressure driven fugitive and vent emissions
  - In previous Workshops, ARB has referenced balance system issues such as VDAPP (Volume dispensing at positive pressure) and RIFE (Reverse Flow through balance nozzles) which have a negative impact on overall vapor recovery efficiency
    - I recall VR-OP-B1 study from 6 Dec 2017 that concludes with promise of additional study required
      - Has the additional study been completed?
- We don't expect a state-wide mandate to force 100% of CA GDF to use our certified system
  - However, we feel that an across the board relaxation of the ISD Pressure Alarm criteria is not necessary and will in-fact allow continued generation of large pressure driven storage tank emissions, where these emissions can be efficiently controlled at a cost-effective level with proven and commercially robust technology
  - We suggest that ARB consider following a Tiered approach, where granularity relative to GDF throughput can be wisely applied
    - For example, the tabulation of a GDF emission factor (lb/1,000 gal) can be combined with monthly GDF throughput (gal/month) to yield a maximum threshold of monthly emissions (lb/month)

            - Sites exceeding this threshold, should be subject to use of a high capacity processor to yield emissions reductions below the threshold level
        - Alternatively, the existing ISD pressure alarm limits can remain in place for GDF of a given throughput and above
            - For example; GDF > 150,000 gal/mo or GDF > 300,000 gal/mo
                - Perhaps GDF location relative to sensitive receptors can be factored in to the throughput threshold to avoid health risks
                - Based on cancer risk estimates, CARB in 2005 recommended that schools, day cares, and other sensitive land uses should not be located within 300 ft. (91 m) of a GDF with annual sales volume of 3.6 million gallons
                    - This recommendation was apparently based on the assumption of 90% reduction of benzene emissions with controls at that time
            - The Informational Bulletin released on 4 Dec 2017 and entitled, "New Recommendations to Minimize Wintertime In-Station Diagnostic (ISD) System Overpressure Alarms for Assist Phase II Systems" has a disclaimer that reads, "*These recommendations are intended for GDF with a monthly throughput of less than 400,000 gallons*"
                - This indicates that ARB is aware of the impact of air ingested through PV valves at higher throughput stations
        - A further alternative might involve a slight adjustment of the existing ISD pressure alarm limits
            - For example, the stated values in CP-201 for the 7-day and 30-day (95th and 75th percentile) pressure limits are 1.5 and 0.5 iwc, respectively
            - In practice, the actual values are 1.3 and 0.3 iwc, respectively, due to pressure transducer accuracy
            - Perhaps the actual values can be ratcheted-up slightly, where nuisance alarms can be avoided, but where bonafide alarms are a real indication of excessive fugitive and/or vent emissions
    - ARB has worked very hard over many decades to constantly ratchet-down emissions; why all of a sudden give up all those hard-earned emissions reductions in a wide sweeping relaxation of stringent metrics?
        - The front-end Phase II and ORVR vapor recovery efficiencies are impressive
        - The back-end Storage Tank pressure driven vent and fugitive emissions unfortunately negate a large portion of the front-end gains
        - Addressing the Storage Tank pressure driven emissions with properly designed processors preserves the overall vapor recovery and containment performance sought by the Enhanced Vapor Recovery Program