

## **dKC de la Torre Klausmeier Consulting**

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**1401 Foxtail Cove  
Austin, TX 78704  
(512) 447-3077**

**E-mail: delaklaus@aol.com**

### **Technical Note**

Date: March 9, 2012  
To: Dileep K. Birur, RTI International, Inc.  
From: Rob Klausmeier, de la Torre Klausmeier Consulting, Inc.  
Subject: **Comments on the Report “Evaluation of the Effectiveness of On-Board Diagnostics (OBD) Systems in Identifying Fuel Vapor Losses from Light-Duty Vehicles”**

As requested by RTI, I have reviewed ERG’s report evaluating the effectiveness on-board diagnostics (OBD) systems in identifying vehicles with significant fuel vapor losses. I have been involved in mobile source evaporative emissions modeling since 1985 and have helped many states implement OBD inspections as part of their inspection/maintenance (I/M) programs. As a result, I recognize the important consequences of the initial findings of this report – that OBD systems may not identify a large fraction of the fleet (50-70%) with excessive evaporative emissions. This finding affects both state implementation plans with regards to the effectiveness of I/M programs and future strategies for phasing out Stage II systems and instead relying on on-board refueling vapor recovery (ORVR) systems to control refueling emissions. **I believe that the data collected and analyzed in this study are inadequate to make these conclusions, and that the report should not be released until sampling concerns listed below are addressed.** My comments are broken into major and editorial comments.

### **Major Comments:**

I have several concerns over the sample size and methodology used to procure vehicles for this test program and accordingly the representativeness of the test sample. In addition, I have concerns over some of the OBD assumptions. Below are my comments:

- I recognize the difficulty in identifying vehicles with high evaporative emissions, but this reality does not negate the fact that you cannot make a definitive conclusion on OBD performance based on 10 high emitting vehicles.
- The report should present more details on how vehicles were procured for the PSHED test. The report notes that priority was given to recruiting vehicles that had high evaporative indices as determined by RSD measurements. The report should provide details on the number of vehicles screened by RSD, the fraction of the fleet that had high evaporative indices based on RSD, and the ultimate fraction of the fleet that received PSHED and OBD tests. Information on the year, make and model of vehicles that received PSHED tests would be useful.

- The report appears to make the assumption that vehicles identified for testing because they had high evaporative indices are representative of all vehicles that have high evaporative emissions. The report does not provide evidence that vehicles with high evaporative indices based on RSD are necessarily typical of all vehicles with high evaporative emissions. For example, vehicles with vapor leaks that do not create a hydrocarbon plume while the vehicle is driven but still create significant vapor losses during hot-soak and diurnal conditions would not have high RSD evaporative indices. As a result, I have concerns over the conclusion that OBD misses 50-70% of the high evaporative emitters. Instead, the report can only conclude OBD misses 50-70% of the high evaporative emitters as determined by the RSD evaporative index, with the sample size caveat.
- The authors should collect and analyze data from I/M programs, California roadside emission tests, and other sources to validate, if possible, the assumption that vehicles with high evaporative emissions identified in this study are typical of all vehicles with high evaporative emissions.
- The report assumes that because the evaporative monitor is ready the OBD system has recently checked the evaporative emission control system. After the evaporative monitor becomes ready it stays ready until codes are cleared. Because most vehicles, particularly older models, have stringent criteria to run the evaporative monitor, a vehicle could likely have a problem with the evaporative emission control system, be ready, and have the MIL-off (with no DTCs). The OBD system may eventually identify the problem, set an evaporative emission DTC and turn the MIL on.
- The report notes that some vehicles with high evaporative emissions had exhaust related DTCs but no evaporative DTCs. Did ERG investigate the enabling criteria for the evaporative DTCs to see if the presence of exhaust DTCs might have kept the evaporative monitor from running?
- The report should attempt to compare the distribution of diagnostic trouble codes (DTCs) observed in this sample with the distribution of DTCs found in vehicles tested in I/M programs. In Connecticut, for example, 17% of the vehicles with illuminated MILs have evaporative emission DTCs. The top evaporative DTCs in Connecticut (in descending order) are P0442, P0455, P0440, P0441, P0446, and P0456. The four evaporative DTCs in ERG's study are P0442, P0443, P0451, and P0457. Only one appears on Connecticut's top evaporative DTC list.
- Also, even though it's not the mission of the report to evaluate the RSD evaporative index, the fact that only 29 out of 157 vehicles exceeded the 0.3g/Qhr threshold raises concerns about the effectiveness of the RSD based index in identifying vehicles with excessive evaporative emissions.

### **Editorial Comments:**

I have provided a marked-up copy of the report that contains editorial comments.