

# **Comments on ARB Ethanol Permeation Inventory Estimates**

July 24, 2006

AIR, Inc.

for Western States Petroleum Association

# Recent ARB Reports and Presentations

- On-road draft memo (June 29, 2006)
- Off-road draft memo (June 29, 2006)
- Presentation: On- and Off-road Ethanol Emission Impacts (June 30, 2006)

# Old Comments

- On-road
  - The report and presentation do not address the comments WSPA raised in April and May, 2006
    - CARB assumption is unsupported: 90% of resting losses are permeation, at all temperatures, for all vehicle classes and technologies
    - CARB assumes augmentation ratio for liquid leakers of 1.05. Data support ratio of 1.02. Difference is 1 tpd, or 4-5%
    - CARB uses ambient temperatures when tank temperatures should be used
- Off-road
  - For Portable Fuel Containers, the report **did** address WSPA's comment on averaging emissions before estimating percent changes
  - However, it did not address the appropriateness of adjusting the entire off-road inventory with tests on only 5 lawnmowers with no evaporative emission controls

# New Comments

- On-road
  - ARB method overpredicts the ethanol permeation increase at higher temperatures
  - If it overpredicts at higher temperatures, it probably overpredicts at lower temperatures (i.e., CA 8-hour ozone standard temps) as well
- Off-road - preliminary comments (we are still evaluating the off-road inventories)
  - The off-road inventories do not include some evaporative emission controls adopted by the EPA
  - Diurnal inventories for pleasure craft could also be significantly overstated
  - Staff is using the same adjustment factors for equipment with evaporative emission controls as equipment without evaporative emission controls

# On-Road Overprediction

Source	Temp	MTBE* g/d/veh	ETOH* g/day/ veh	Increase g/day/veh	Time
CRC Data	65-105	2.1	3.5	1.4	24 hrs
ARB Prediction	70-98	3.1	4.7	1.6	18 hrs**

\* Diurnal permeation emissions

\*\* Subtract 6 hours due to hot soak and running

**Why is ARB calculated increase higher than CRC data, though temperature range is lower, and daily time is shorter?**

# Potential Reasons for ARB Overprediction vs Data

- Ethanol augmentation ratios for normal and moderate emitters?
- Liquid leaker differences?
- Fleet emission differences?
  - I.e., EMFAC fleet higher emitting than CRC
- Permeation fractions?

# Ethanol Augmentation Ratios

- Staff's analysis based on CRC hour-by-hour data
  - Normal vs. moderate emitters separate
- No change in ratios vs. temperature for either class
- Analysis seems reasonable

# Liquid Leaker Differences

- No liquid leakers in CRC
- Leakers are included in ARB EMFAC
  - No argument about the need to include something here
- But, they only account for 12% of the 1.6 g/day increase for the SCOS episode
  - Normals: 18.8 tpd (63%)
  - Moderates: 7.1 tpd (25%)
  - Leakers: 3.6 tpd (12%)
- Permeation rate for liquid leakers should be the same as for other classes. The fact that there is a liquid leak, should not affect the permeation through fuel system materials. ARB mistakenly assumes they are higher.

# Fleet Emission Differences

Source	Emitter	MTBE g/day Permeation	Temp F	%
EMFAC	Weighted normals	0.78	70-98	40%
	Weighted Moderates	1.20		60%
	Total	1.98		
CRC	Weighted normals	0.80	65-105	38%
	Weighted Moderates	1.30		62%
	Total	2.1		

**CRC fleet represents EMFAC well.**

# Conclusions - On Road

- All models should be validated against data
- ARB model does not even agree with the data on which it is based
  - We've explored potential reasons for overprediction, and believe that it stems from assumption on permeation fractions by process
  - Augmentation ratios, fleet make-up OK, liquid leaker effects small
  - Modeling approach is overly complex and requires too many unsupported assumptions
- If ARB can fix the overprediction problem for SCOS temperatures, or explain the difference from CRC, then we would be a lot more comfortable with the ARB method

## Off-Road

- Off-road ethanol permeation emission increase:
  - Ethanol augmentation ratio based on data from 5 lawnmowers
- If base permeation inventory is in error, permeation increase caused by ethanol will be in error
- We are evaluating both the base inventories and 5 lawnmower data

# Base Inventories

- Appear not to include the following “on the books” controls implemented by EPA:
  - Reduced tank permeation for
    - Recreational vehicles
    - Large SI (forklifts, etc.)
  - Reduced hose permeation for same vehicles
- Diurnal emissions from pleasure craft may be too high
  - May not reflect much lower tank temperature swings for these sources based on EPA data and EPA modeling methods used in NONROAD2005
  - Has ARB based pleasure craft evaporative inventories on real data?

## 5 Lawnmower Data

- Augmentation ratios developed on uncontrolled lawnmowers should not be applied to every other type of uncontrolled equipment
  - Lawnmowers: very short hoses and small tanks
- Augmentation ratios developed from uncontrolled lawnmowers should not be applied to lawnmowers with evaporative emission controls, or all other sources with evaporative emission controls