Possible Tank Transitions

Possible Transitions at the Terminal	Corresponding Transitions at Service Station or Vehicle Tank
Zero Oxygen RFG to CARBOB	Zero Oxygen RFG to Ethanol fuel
CARBOB to Zero Oxygen RFG	Ethanol fuel to Zero Oxygen RFG
CARBOB (A) to CARBOB (B)	Ethanol fuel (A) to Ethanol fuel (B)

FUEL PROPERTIES	ARB FUELS				LOW SULFUR FUELS	
	CaRFG	2.0%	2.7%	3.5%	2.0%	2.7%
Aromatics, vol.%	25	25	25	25	26.0	26.9
Benzene, vol.%	0.6	0.8	0.7	0.7	0.73	0.77
Olefins, vol.%	6	6	4.0	1.0	5.6	4.2
Sulfur, ppm	10	21	14	5.0	14.1	11.8
T50, deg. F	210	213	206	213	214	211
T90, def. F	305	305	310	310	310	312
Oxygen, wt.%	0	2.0	2.7	3.5	2.1	2.8
RVP, psi	6.8	6.9	7.2	7.2	6.8	7.0

Number of Vehicle Tank Turnovers that Would not Comply Based on Use of the Predictive Model

Transition from:	Terminal Heel Amount		
	10%	25%	50%
0 to 5.7 vol%	HC 2 RVP 1	HC 3 (2) RVP 1	HC >4 RVP 2
0 to 7.7 vol%	HC 2 RVP 2	HC 2 RVP 3	HC 3 RVP >4
0 to 10 vol%	HC 3 RVP 2	HC 3 RVP 3	HC >4 RVP >4
5.7 to 7.7 vol% (H)	NOx 2	NOx 2	NOx >4
5.7 to 7.7 vol% (L)	0	NOx 1	NOx 1
5.7 to 10 vol%	0	NOx 2	NOx >4
7.7 to 10 vol%	0	NOx 2	NOx 4
7.7 to 5.7 vol% (H)	0	0	HC 1
7.7 to 5.7 vol% (L)	HC 1 (0)	HC 2	HC 4
10 to 5.7 vol%	0	HC 1 (2)	HC 3
10 to 7.7 vol%	0	0	HC 2
5.7 to 0 vol%	HC 3 (2) RVP 1 (0)	HC 2 (0) RVP 1	HC 1 (0)
7.7 to 0 vol%	HC 3 (2) RVP 1	HC 3 (1) RVP 1	HC 2 (0) RVP 1
10 to 0 vol%	HC 3 (2) RVP 1	HC 3 (1) RVP 1	HC 2 (1) RVP 1

H refers to 5.7 and 7.7 vol% ethanol fuels with 20 and 14 ppmw sulfur, respectively
L refers to 5.7 and 7.7 vol% ethanol fuels with 14 and 12 ppmw sulfur, respectively
The number in parentheses applies only when the number of tank turnovers that would not comply is different for the second vehicle than it is for the first vehicle.

Increased Statewide Exhaust Emissions
If All California Gasoline Transitioned to Different Ethanol Content

Transition from:	Terminal Tank Heel	Pollutant Exceeded	Average Increase During Transition	Percent of CaRFG Benefiets
0 to 5.7 vol%	10%	HC	0.90%	0.35%
	25%	HC	1.19%	0.47%
	50%	HC	2.05%	0.80%
0 to 7.7 vol%	10%	HC	1.01%	0.39%
	25%	HC	1.23%	0.48%
	50%	HC	1.84%	0.72%
0 to 10 vol%	10%	HC	1.24%	0.49%
	25%	HC	1.25%	0.49%
	50%	HC	1.34%	0.52%

Increased Statewide Exhaust Emissions
If All California Gasoline Transitioned to Different Ethanol Content

Transition from:	Terminal Tank Heel	Pollutant Exceeded	Average Increase During Transition	Percent of CaRFG Benefiets
5.7 to 7.7 vol% (H) (Sulfur 20 to 14)	10%	NOx	0.12%	0.13%
	25%	NOx	0.19%	0.20%
	50%	NOx	0.42%	0.44%
5.7 to 7.7 vol% (L) (Sulfur 14 to 12)	10%	NOx	0.01%	0.01%
	25%	NOx	0.02%	0.02%
	50%	NOx	0.07%	0.07%
5.7 to 10 vol%	10%	NOx	0.00%	0.00%
	25%	NOx	0.13%	0.13%
	50%	NOx	0.69%	0.72%
7.7 to 10 vol%	10%	NOx	0.00%	0.00%
	25%	NOx	0.09%	0.10%
	50%	NOx	0.40%	0.42%

Increased Statewide Exhaust Emissions
If All California Gasoline Transitioned to Different Ethanol Content

Transition from:	Terminal Tank Heel	Pollutant Exceeded	Average Increase During Transition	Percent of CaRFG Benefiets
7.7 to 5.7 vol% (L) (Sulfur 12 to 14)	10%	HC	0.03%	0.01%
	25%	HC	0.07%	0.03%
	50%	NOx	0.26%	0.10%
7.7 to 5.7 vol% (H) (Sulfur 14 to 20)	10%	NOx	0.00%	0.00%
	25%	NOx	0.00%	0.00%
	50%	NOx	0.04%	0.02%
10 to 5.7 vol%	10%	HC	0.00%	0.00%
	25%	HC	0.06%	0.02%
	50%	NOx	0.50%	0.19%
10 to 7.7 vol%	10%	HC	0.00%	0.00%
	25%	HC	0.00%	0.00%
	50%	HC	0.12%	0.05%

Increased Statewide Exhaust Emissions
If All California Gasoline Transitioned to Different Ethanol Content

Transition from:	Terminal Tank Heel	Pollutant Exceeded	Average Increase During Transition	Percent of CaRFG Benefiets
5.7 to 0 vol%	10%	HC	0.86%	0.34%
	25%	HC	0.64%	0.25%
	50%	HC	0.42%	0.16%
7.7 to 0 vol%	10%	HC	0.96%	0.38%
	25%	HC	0.77%	0.30%
	50%	HC	0.54%	0.21%
10 to 0 vol%	10%	HC	1.16%	0.45%
	25%	HC	1.03%	0.40%
	50%	HC	0.86%	0.34%

Possible Recommendations for Tank Transitions to Change Ethanol Content of CaRFG3 and Mitigation of Emissions Impact

Transition From	Emission Impact:	Mitigation Conditions Recommended for Emissions
CARBOB to CARBOB (increasing oxygen by no more than 3%)	NOx increase	1. Sulfur of target fuel to be no more than 12 ppmw for 1st tank turnover of the transition. 2. Heel at terminal not to exceed 10% for each tank turnover during the transition
CARBOB to CARBOB (decreasing oxygen by no more than 3%)	HC increase	1. Sulfur of target fuel to be no more than 12 ppmw for 1st tank turnover of the transition. 2. Heel at terminal not to exceed 10% for each tank turnover during the transition
Non-Oxygenated to Oxygenated RFG	HC increase and likely RVP violation downstream of refinery	None known for summer. Allow transition during non-RVP season
Oxygenated RFG to Non-Oxygenated	HC increase and possible RVP violation downstream of refinery	None known for summer. Allow transition during non-RVP season.