MOBILE6.2 Air Toxic: A Time-Series and Sensitivity Analysis

Presented By:

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Conducted By:
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Dale Aspy

Study Goal and Objective

To quantitatively characterize effects of various model input parameters on air toxic emission factors.

MOBILE6.2 History

MOBILE6.2.01

1: Released on: October 31, 2002.

MOBILE6.2.03

1: Released on: September 24, 2003.
2: Policy guidance released on February 24, 2004 on air toxic.

MOBILE6.2 History

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 24 2004

OFFICE OF
AIR AND RADIATION

MEMORANDUM

SUBJECT: Policy Guidance on the Use of MOBILE6.2 and the December 2003 AP-42 Method for Re-Entrained Road Dust for SIP Development and Transportation Conformity

FROM: Margo Tsirigotis Oge, Director
Office of Transportation and Air Quality

Steve Page, Director
Office of Air Quality Planning & Standards

TO: EPA Regional Air Division Directors

MOBILE6.2 History

MOBILE6.2.03

EPA February 24, 2004 Policy Guidance on the Use of MOBILE6.2 …

10. What does the release of MOBILE6.2 mean for analyses of mobile source air toxics impacts under the National Environmental Policy Act?

While MOBILE6.2 is EPA's best available tool for quantifying toxics emissions from on-road vehicles, its availability has no direct bearing on the administration of the National Environmental Policy Act (NEPA). The Department of Transportation has responsibility for implementing NEPA for Federally funded or approved transportation projects, and it is currently developing a policy on how mobile source air toxics should be addressed in NEPA analyses, in consultation with EPA.

Air Toxic Compounds Covered By the Study

Benzene - C_6H_6

Methyl Tertiary Butyl Ether(MTBE) - C_5OH_{12}

1,3-Butadiene - C_4H_6

Formaldehyde - CH_2O

Acetaldehyde - C_2H_4O

Acrolein - C_3H_4O

Air Toxics Not Covered Here

Diesel Particulate Matter and other air toxic pollutants.

Basic Chemistry Understanding

1. Exhaust toxics:

   Produced through combustion in the engine and subsequently reaction in the catalytic converter. New chemicals are generated.

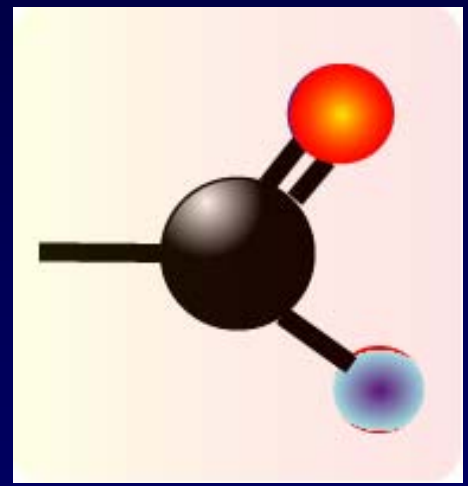
2. Evaporative toxics:

   Generated through a physical evaporation process. No chemical reactions are involved and no new compounds are generated.

Basic Chemistry Understanding

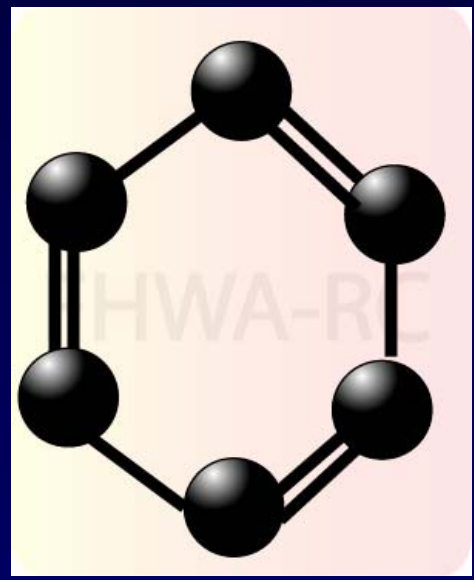
1. Formaldehyde
2. Acetaldehyde
3. Acrolein

→ Aldehyde →



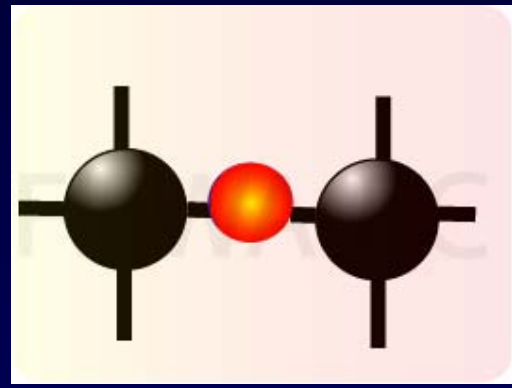
Basic Chemistry Understanding

4. Benzene → Aromatic →

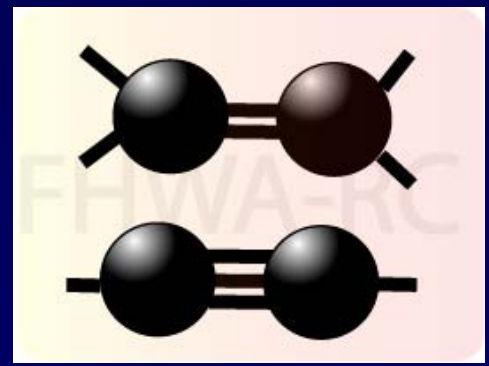


Basic Chemistry Understanding

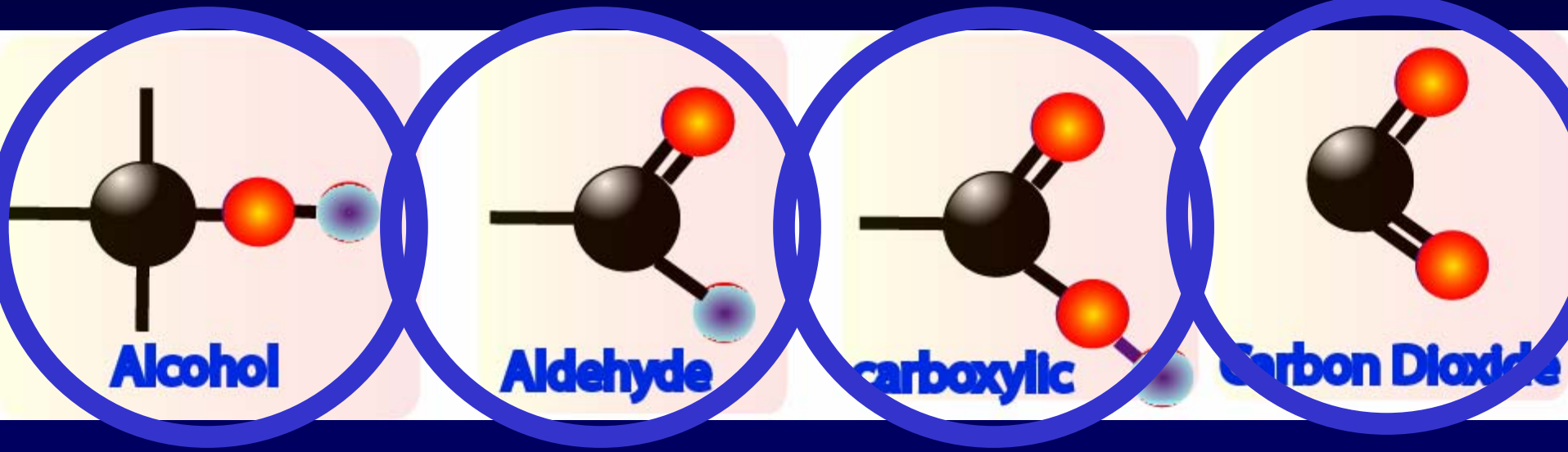
5. Methyl Tertiary Butyl Ether → **Ether** →



6. 1,3-Butadiene → **Olefins** →



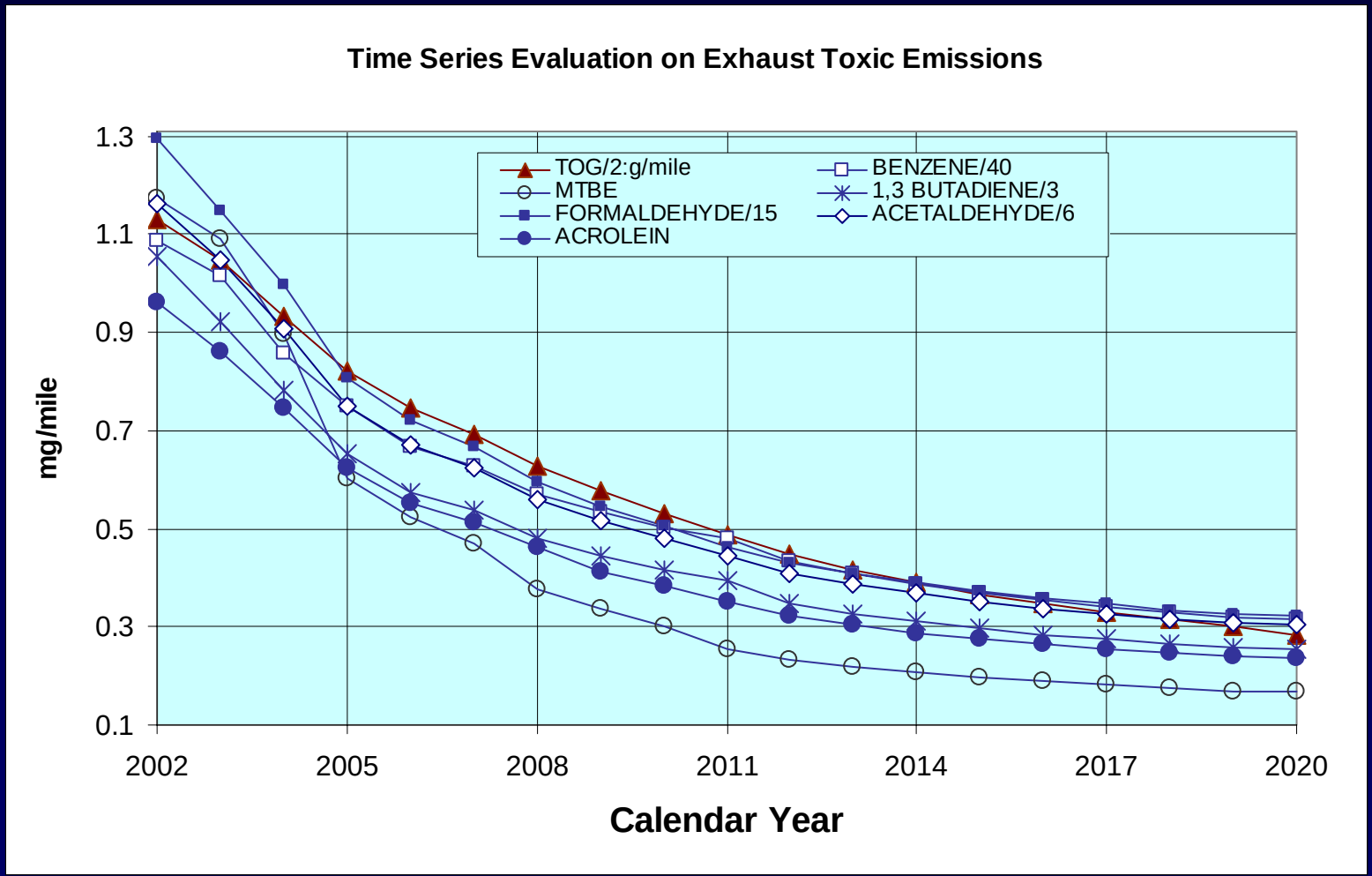
Carbonyl Reaction Pathway



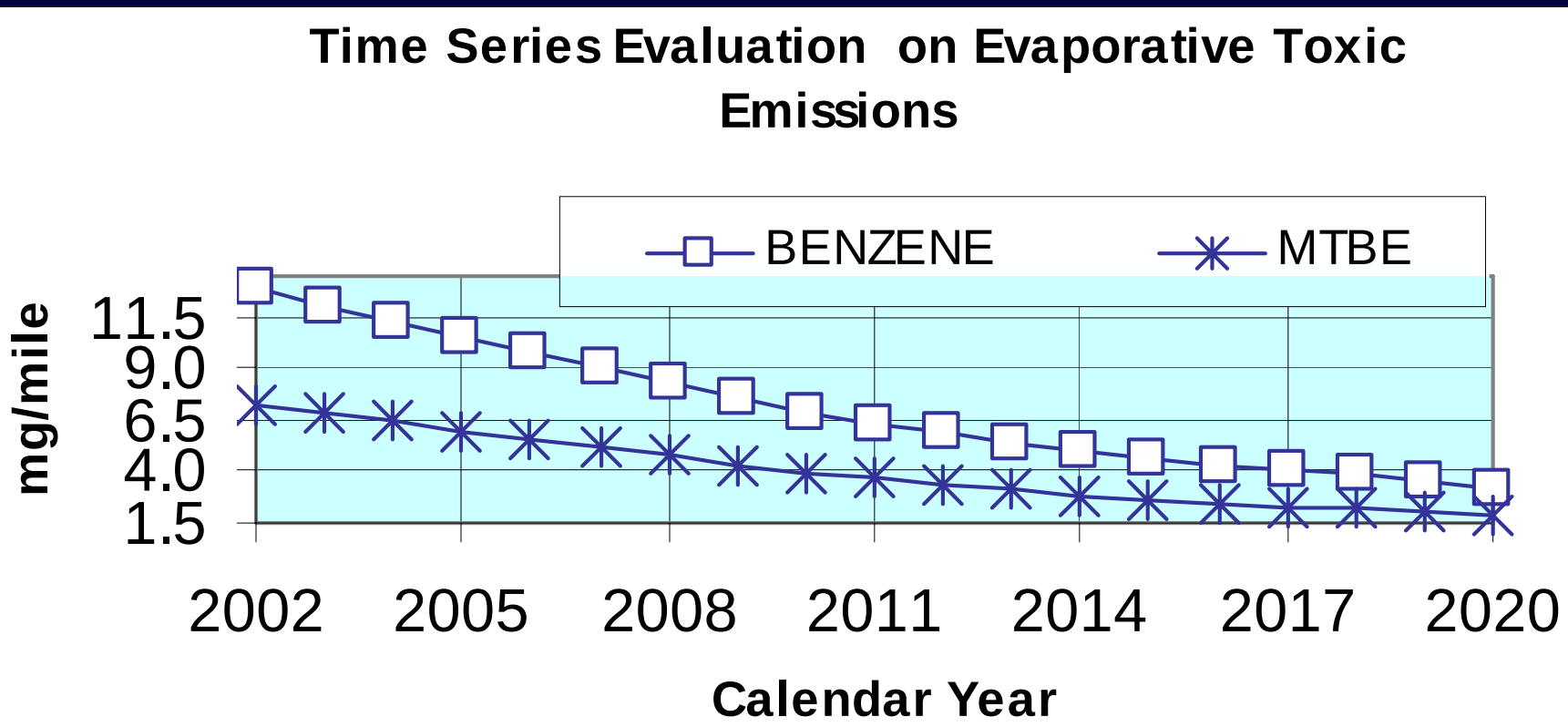
Tested Input Parameters

1. Time-Series: 2002-2020
2. Vehicle Activity: Speed and VMT
3. Fuel RVP
4. Fuel Chemical Properties:
   (Sulfur, E-200, E-300, Aromatic, Benzene, and Olefin Contents)
5. Oxygenated Fuel Components:
   (Ethanol, MTBE, ETBE, and TAME Contents)
6. Environmental Factors:
   (Min/Max Temperatures and Humidity)

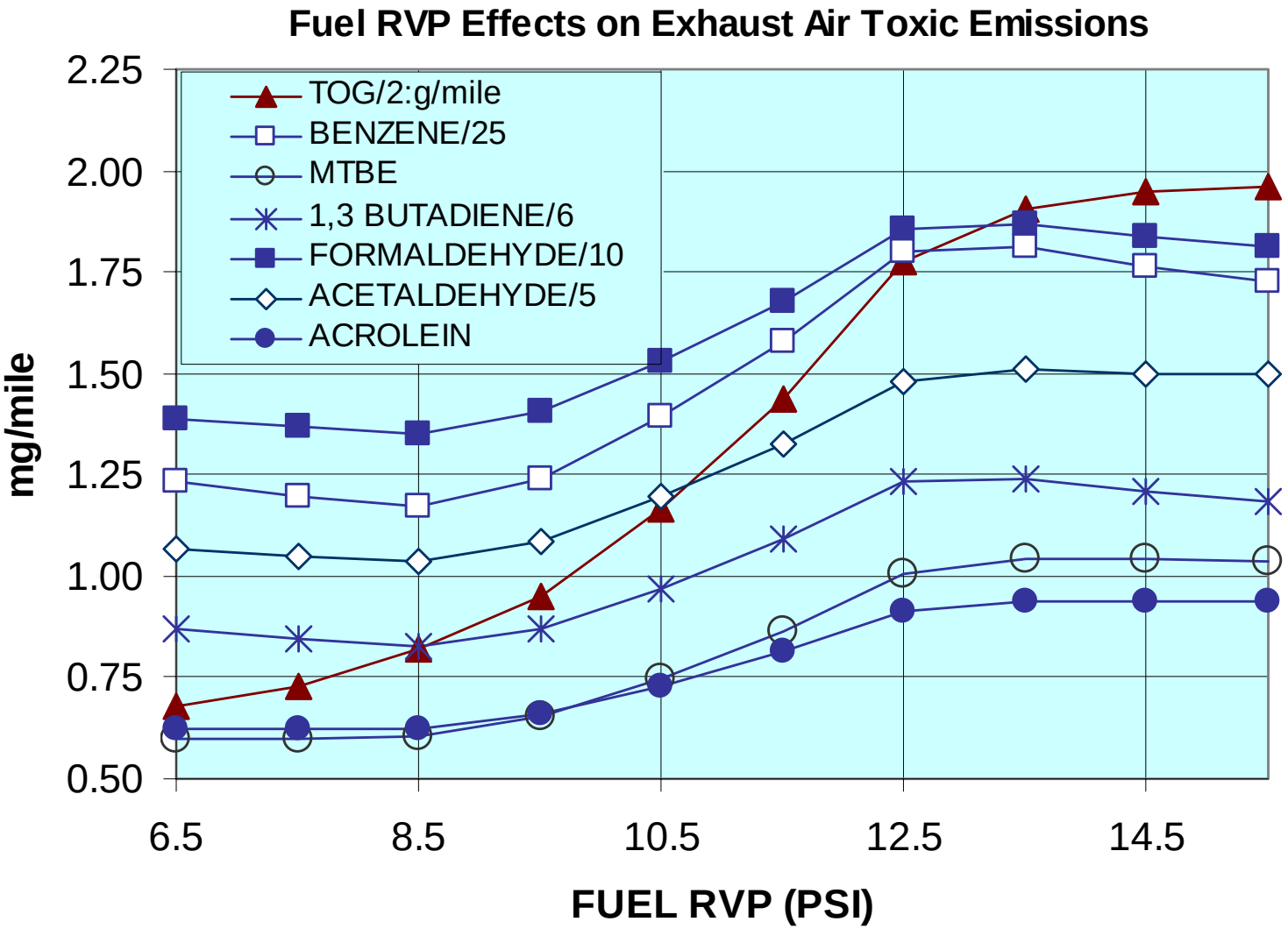
Time Series (Exhaust)



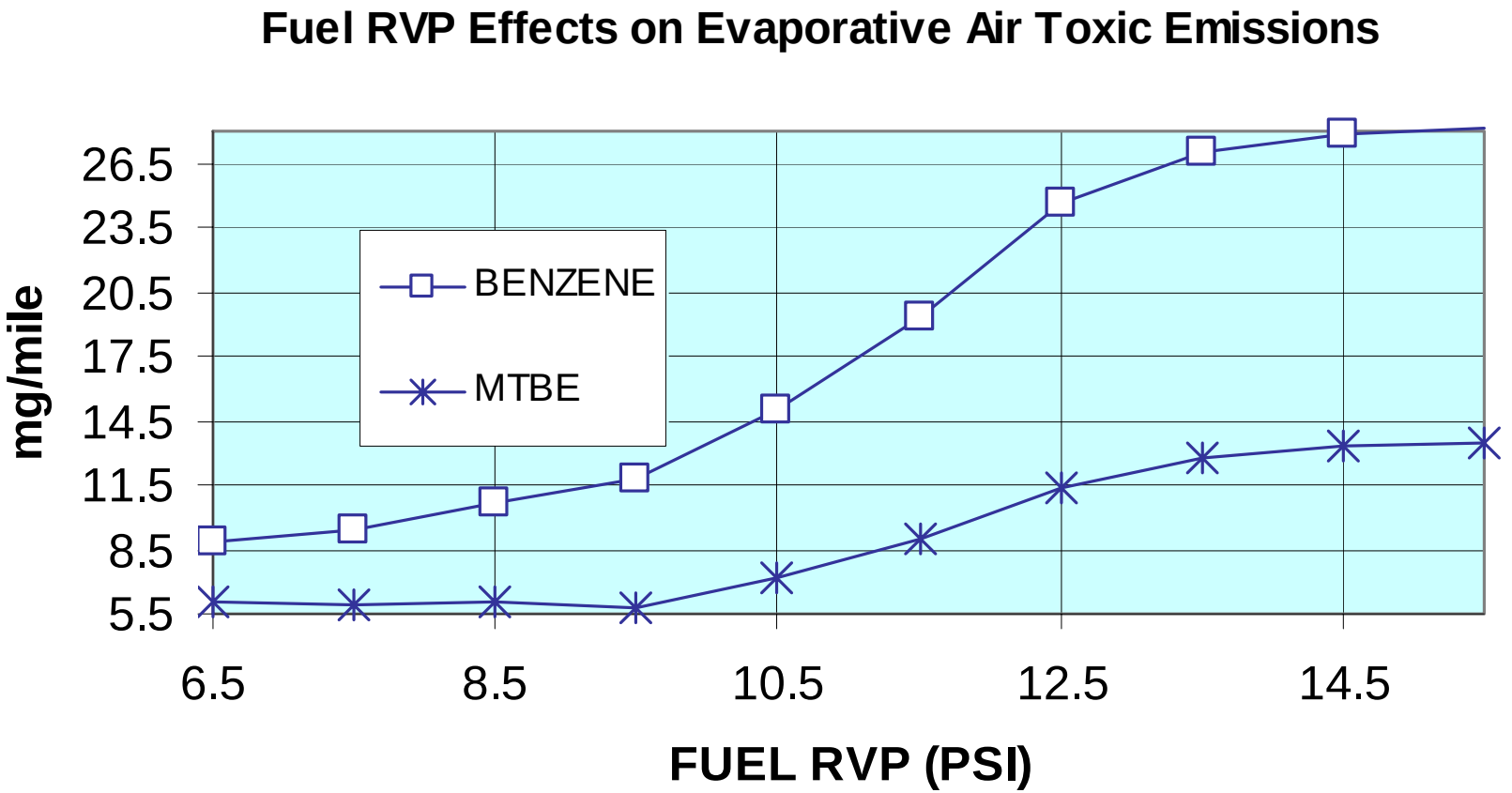
Time Series (Evaporative)



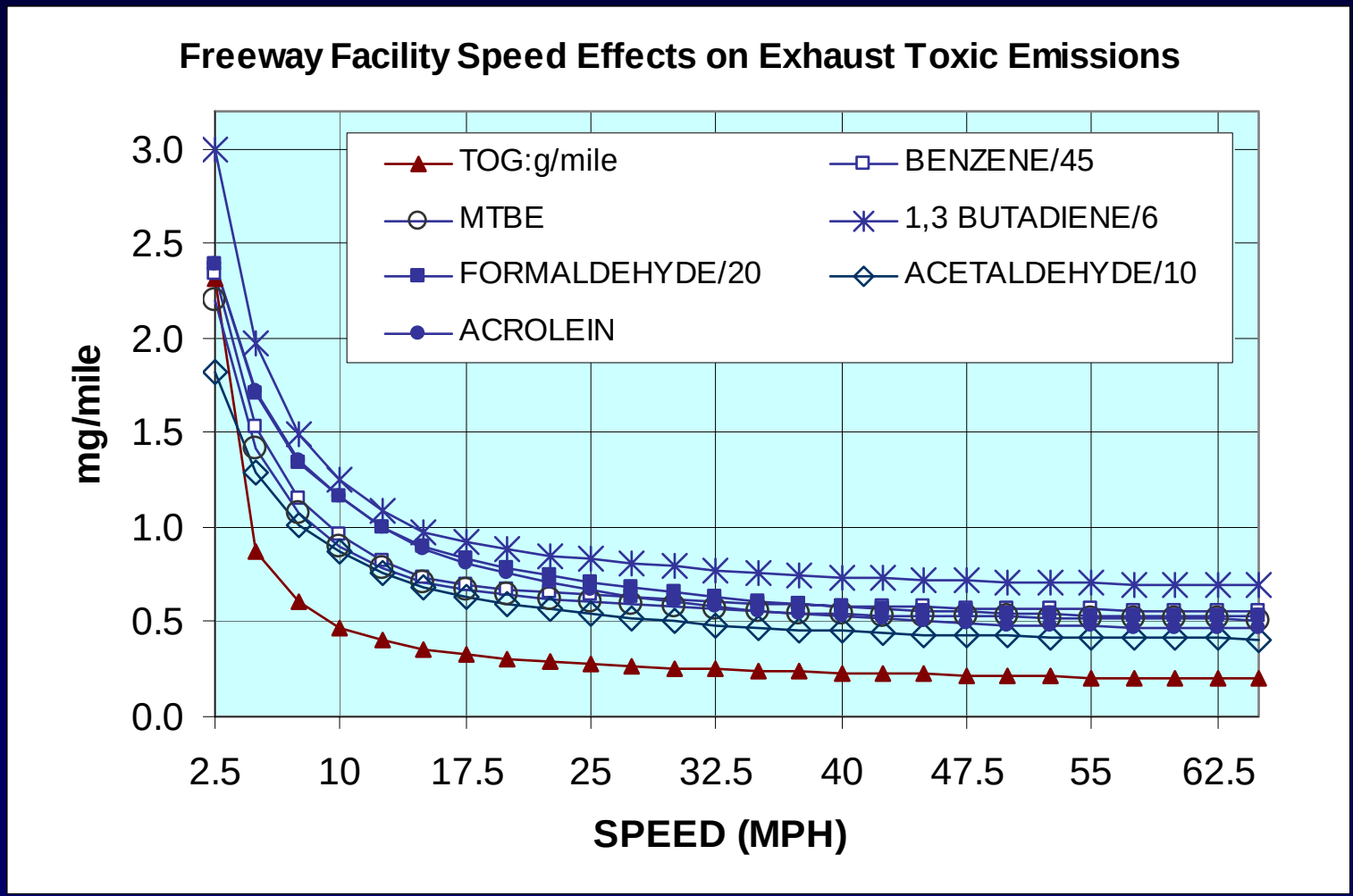
Fuel RVP (Exhaust)



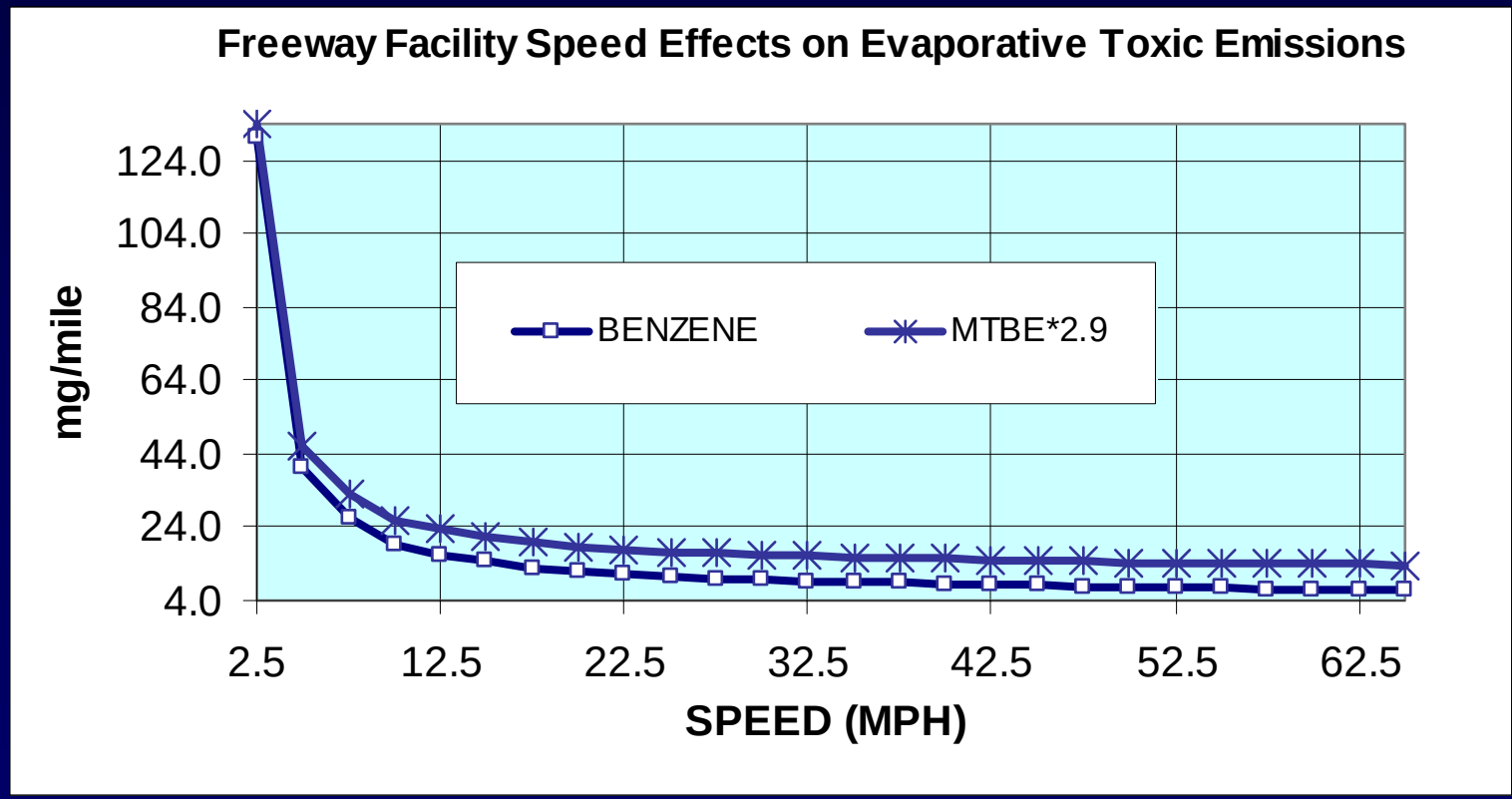
Fuel RVP (Evaporative)



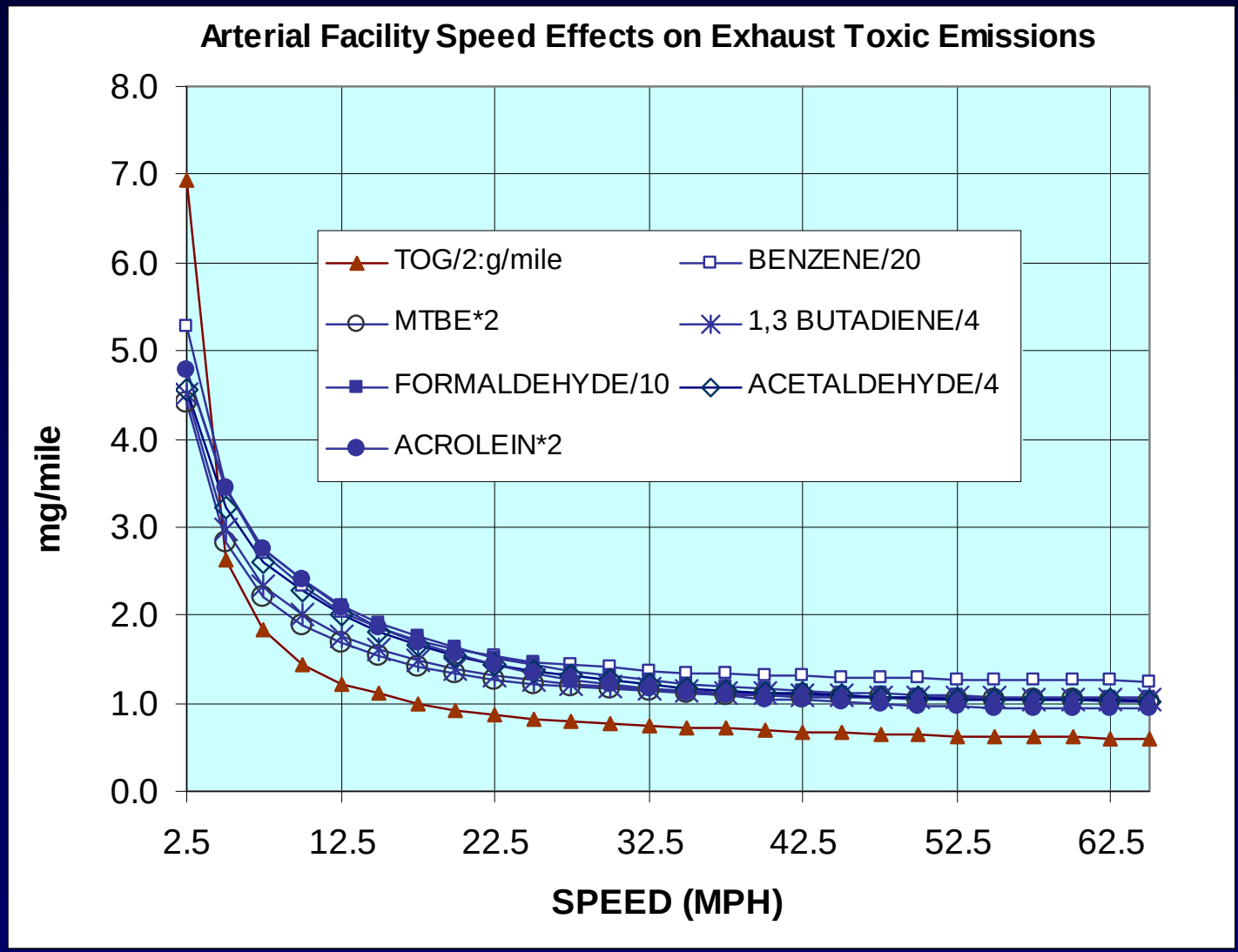
Vehicle Activity - Freeway Speed (Exhaust)



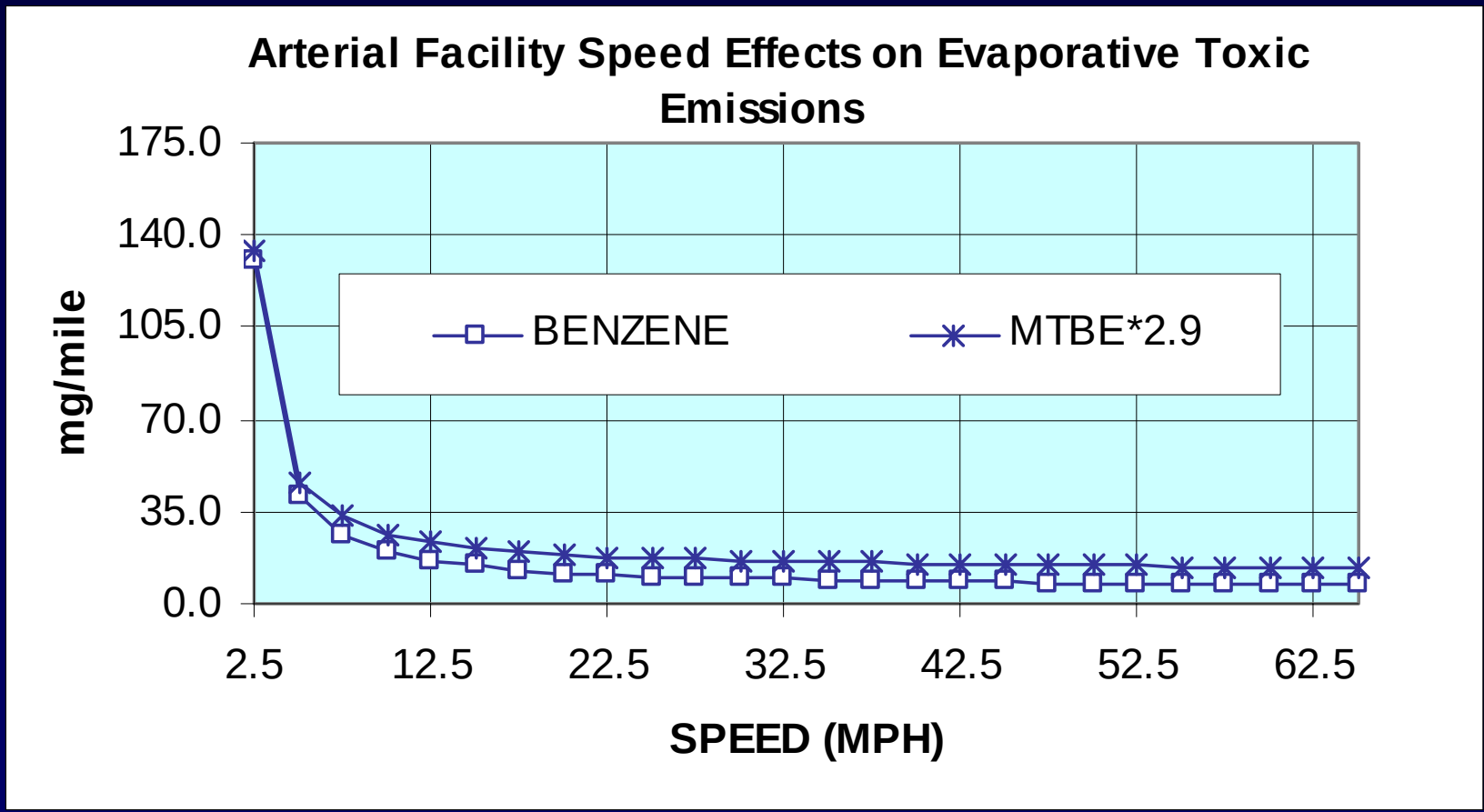
Vehicle Activity - Freeway Speed (Evaporative)



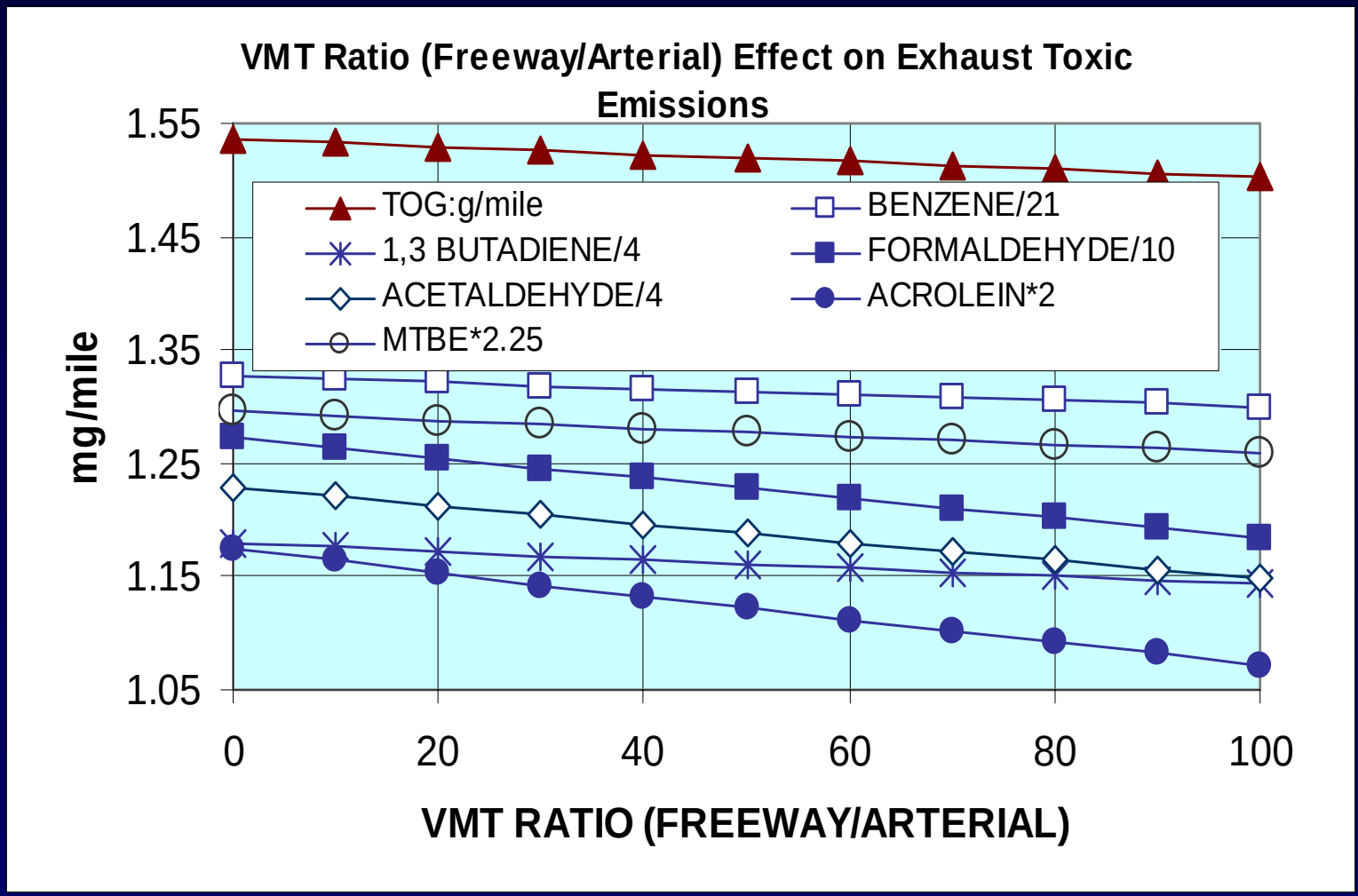
Vehicle Activity - Arterial Speed (Exhaust)



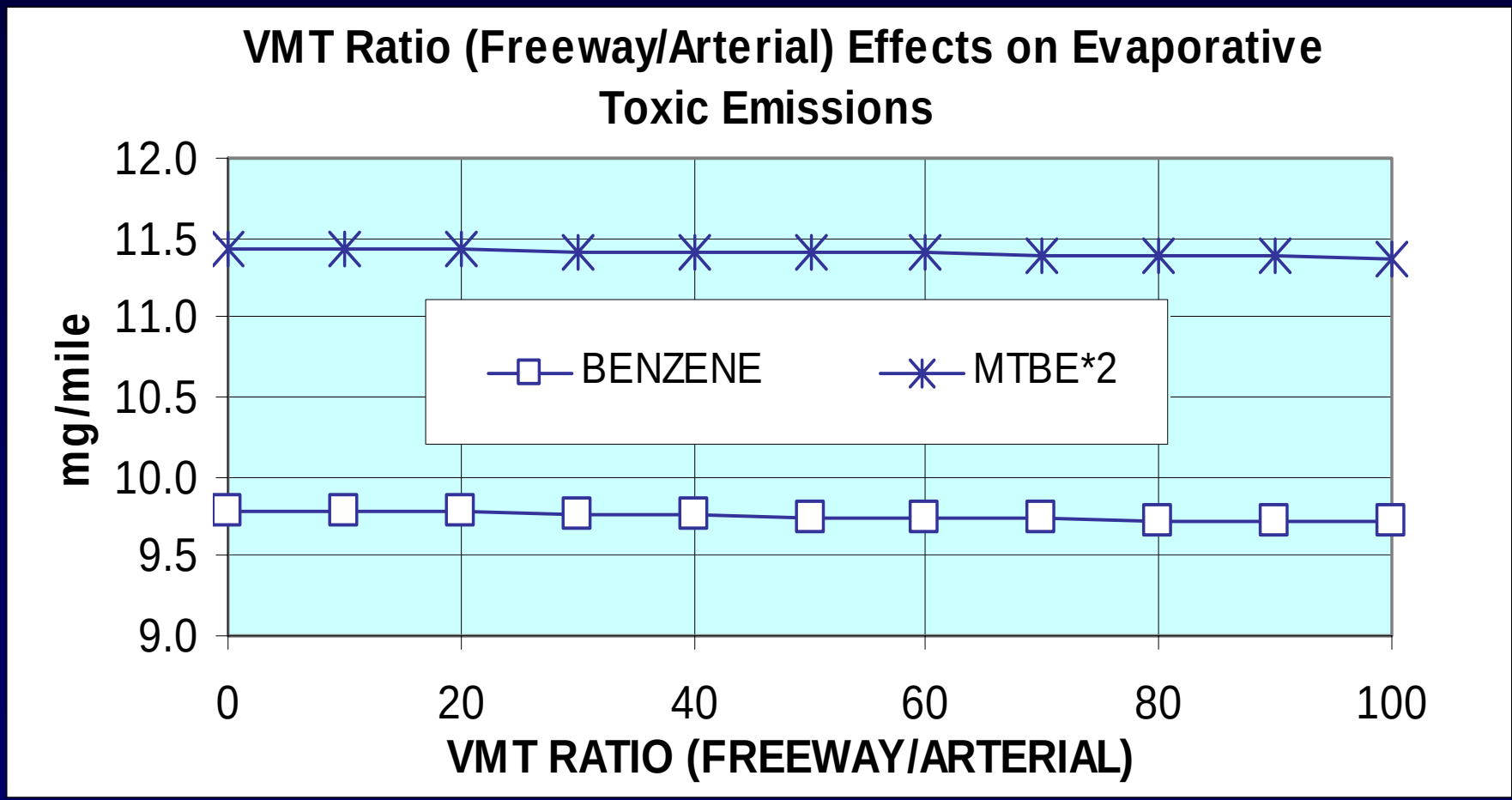
Vehicle Activity - Arterial Speed (Evaporative)



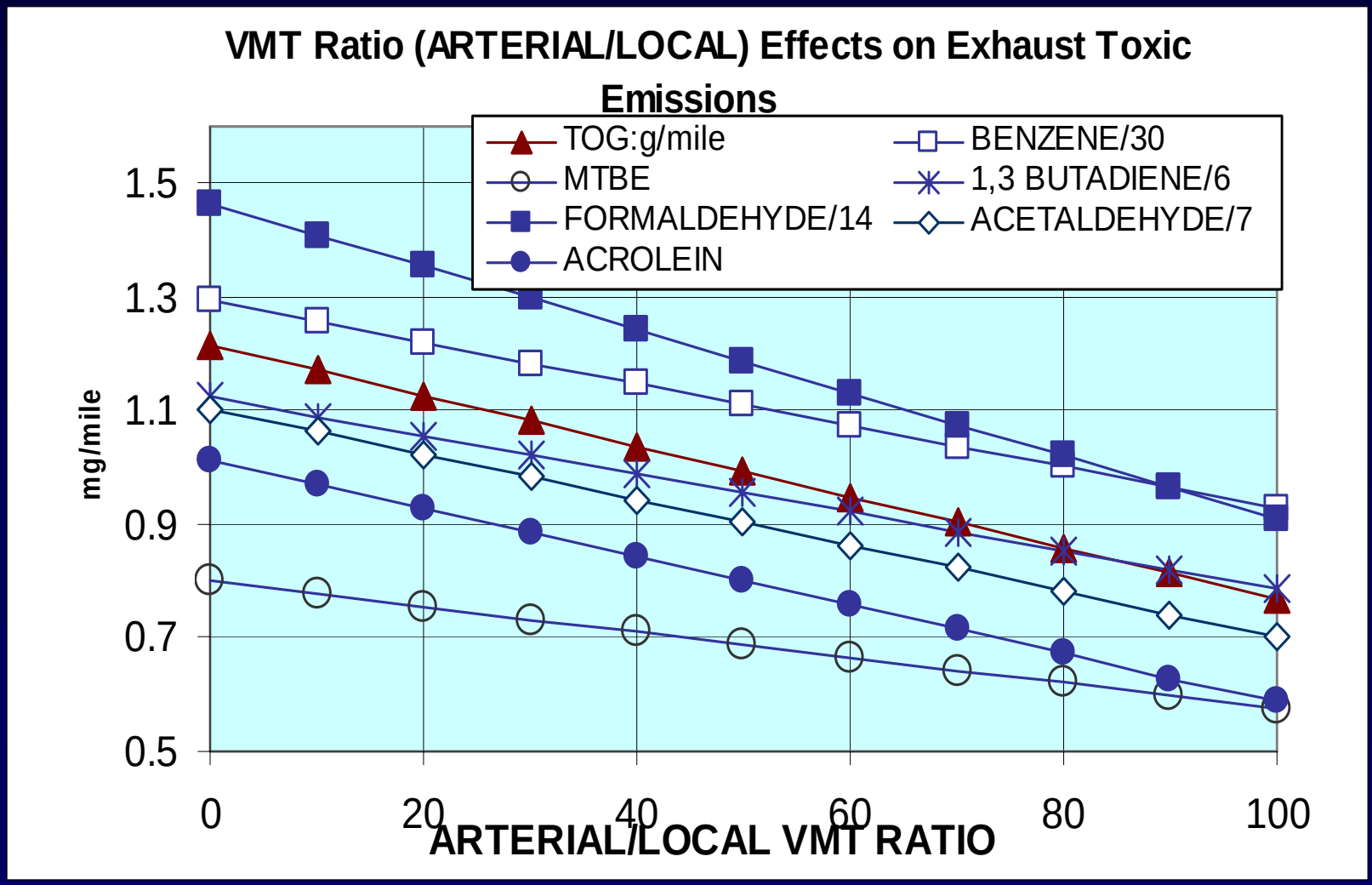
Vehicle Activity- Freeway/Arterial VMT Ratio Exhaust



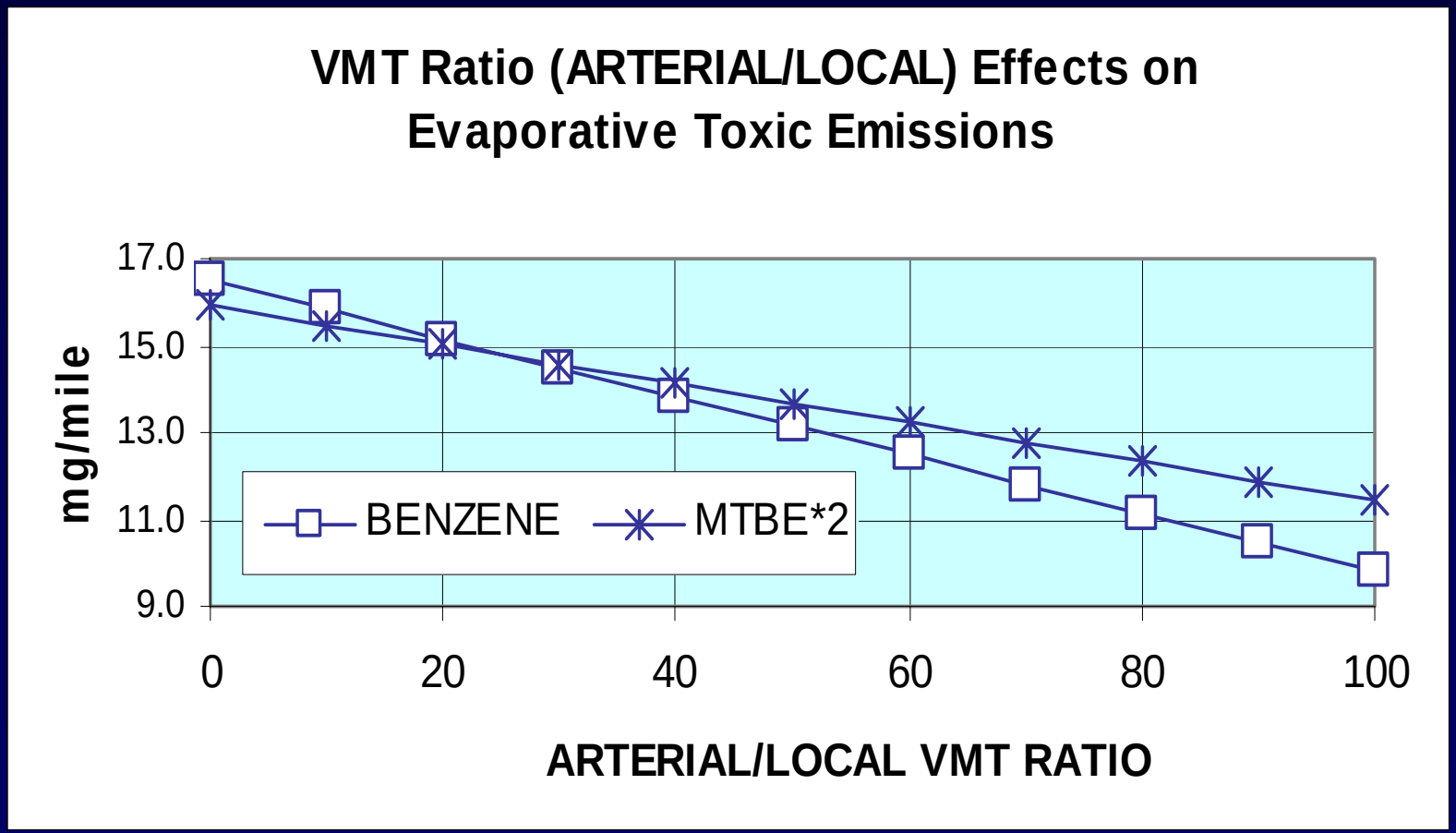
Vehicle Activity- Freeway/Arterial VMT Ratio Evaporative



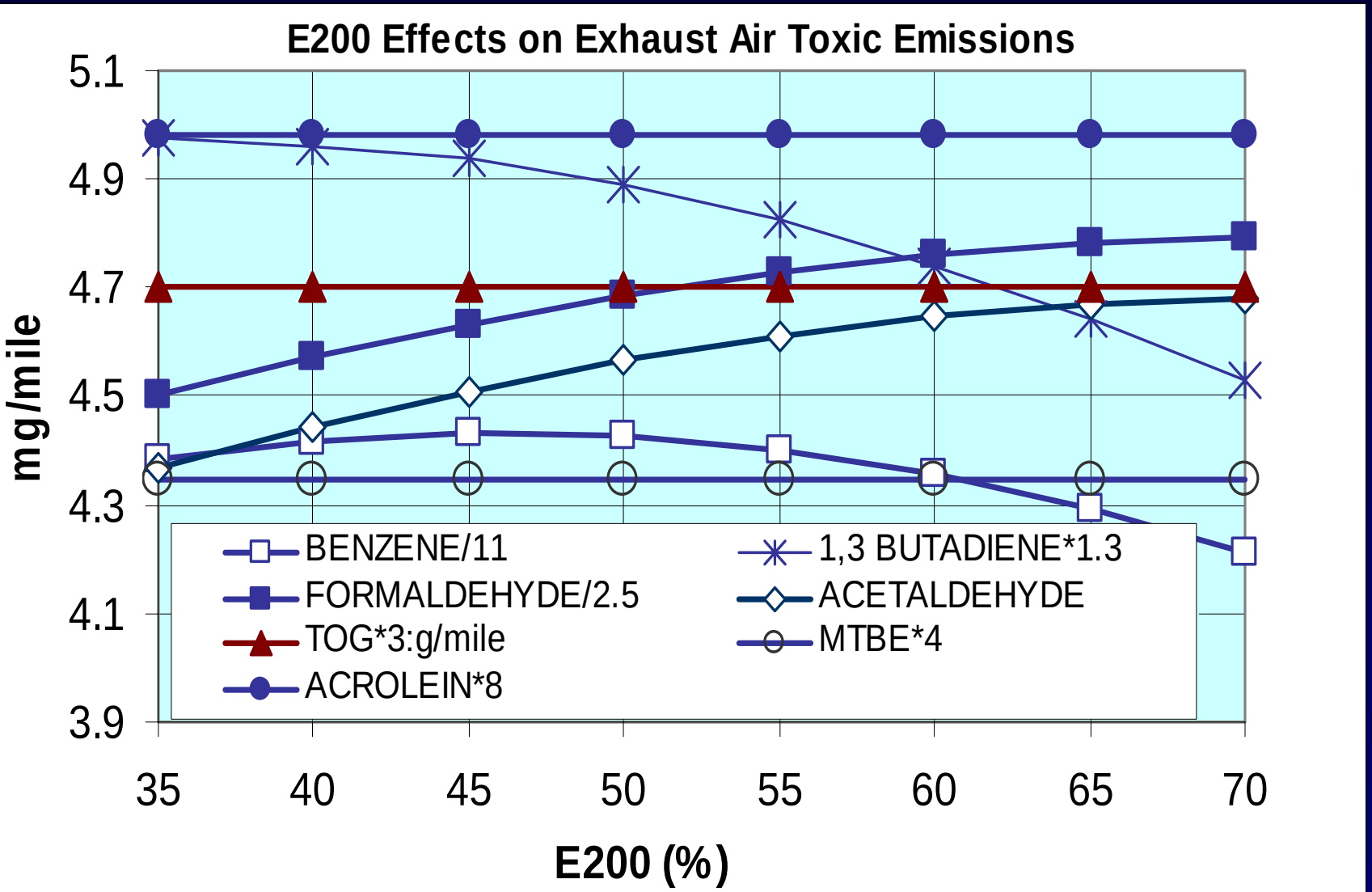
Vehicle Activity - Arterial/Local VMT Ratio Exhaust



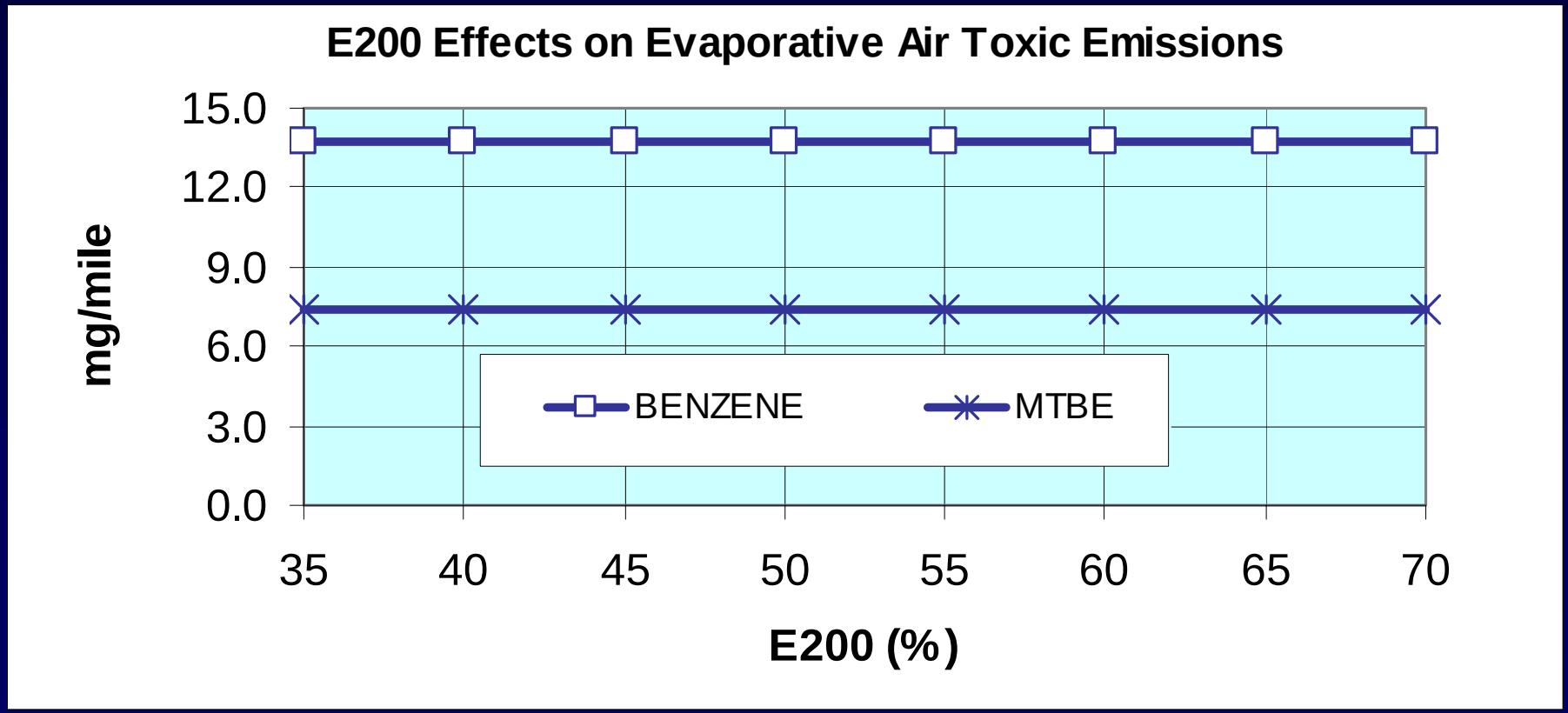
Vehicle Activity - Arterial/Local VMT Ratio Evaporative



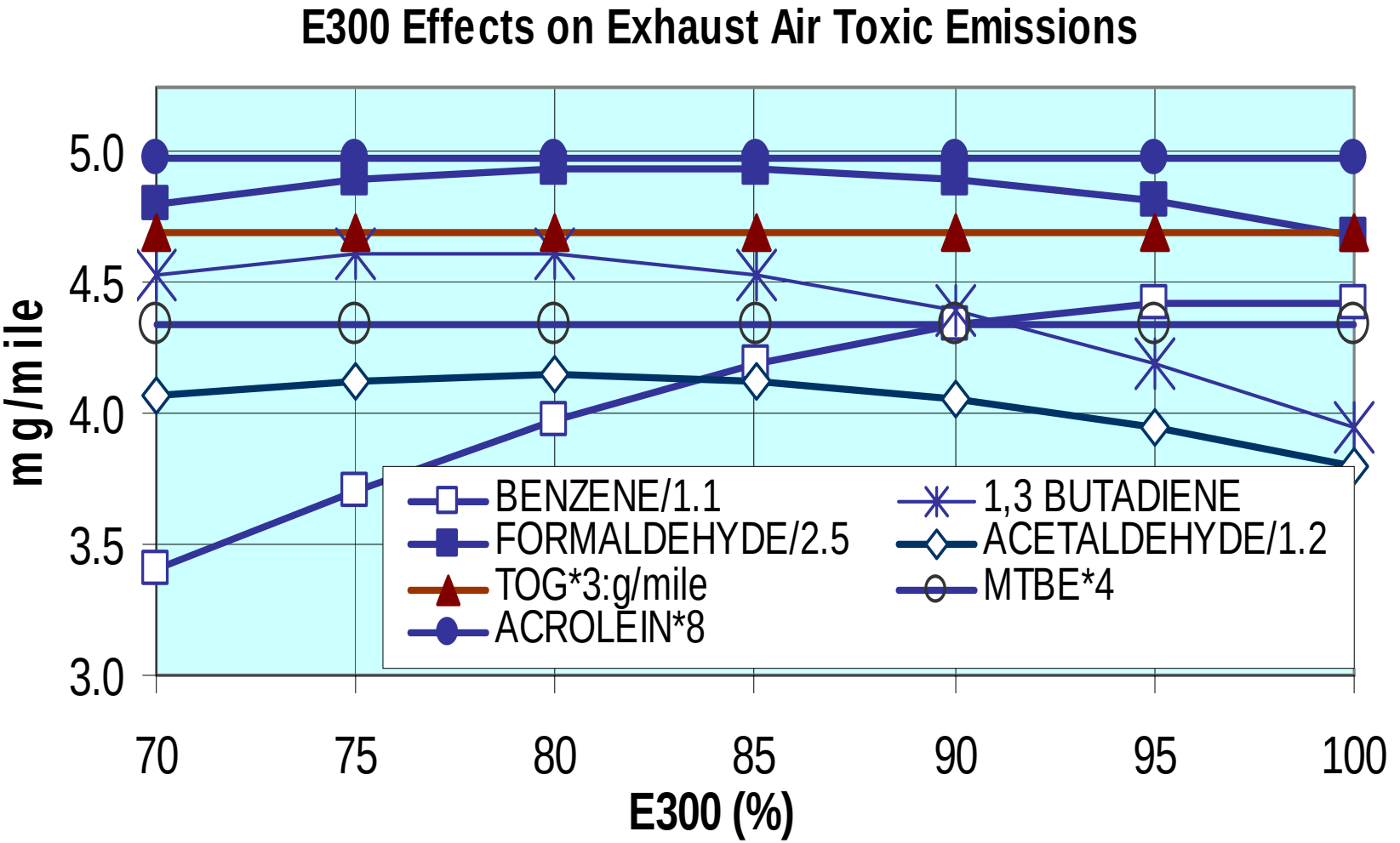
Fuel E200 (Exhaust)



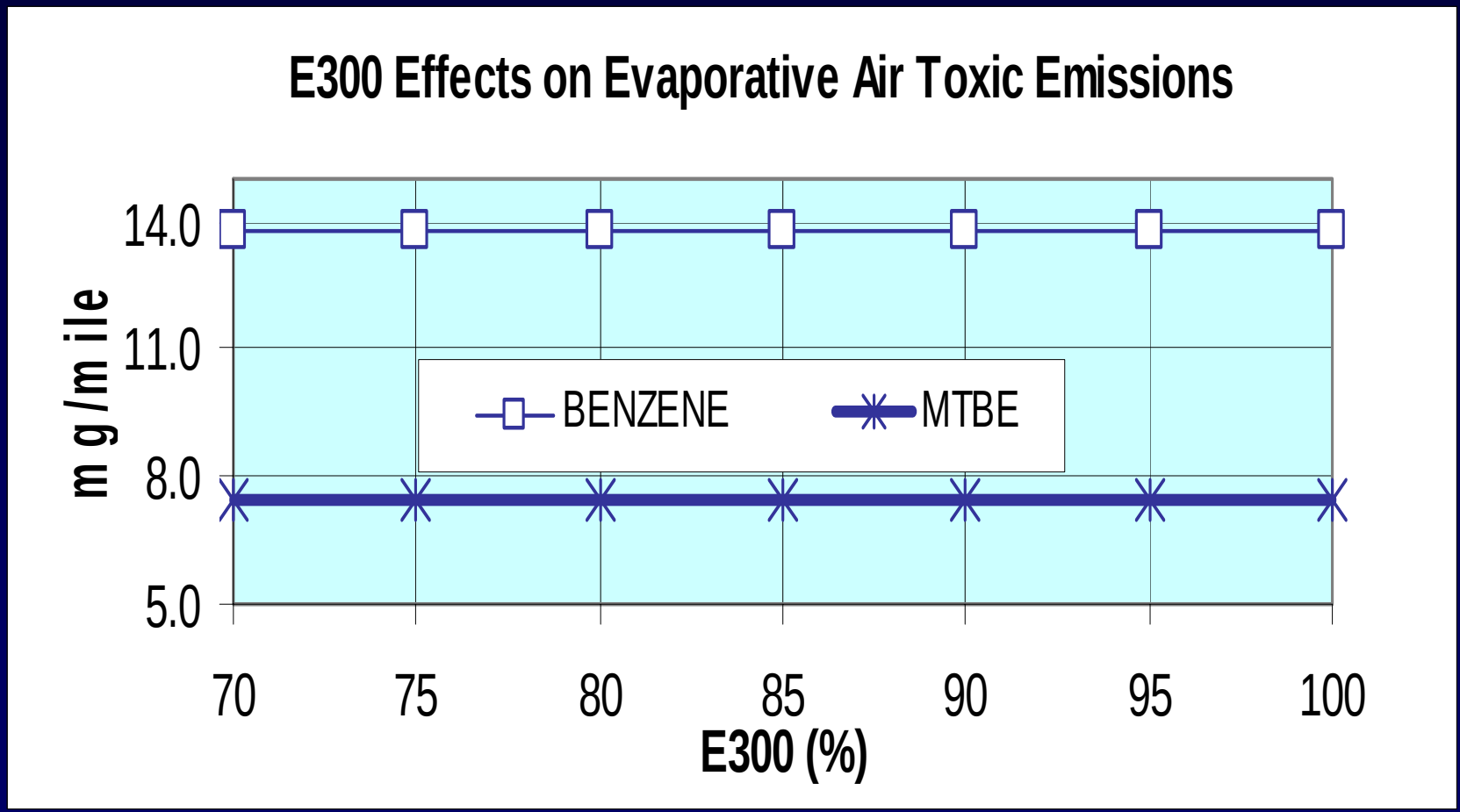
Fuel E200 (Evaporative)



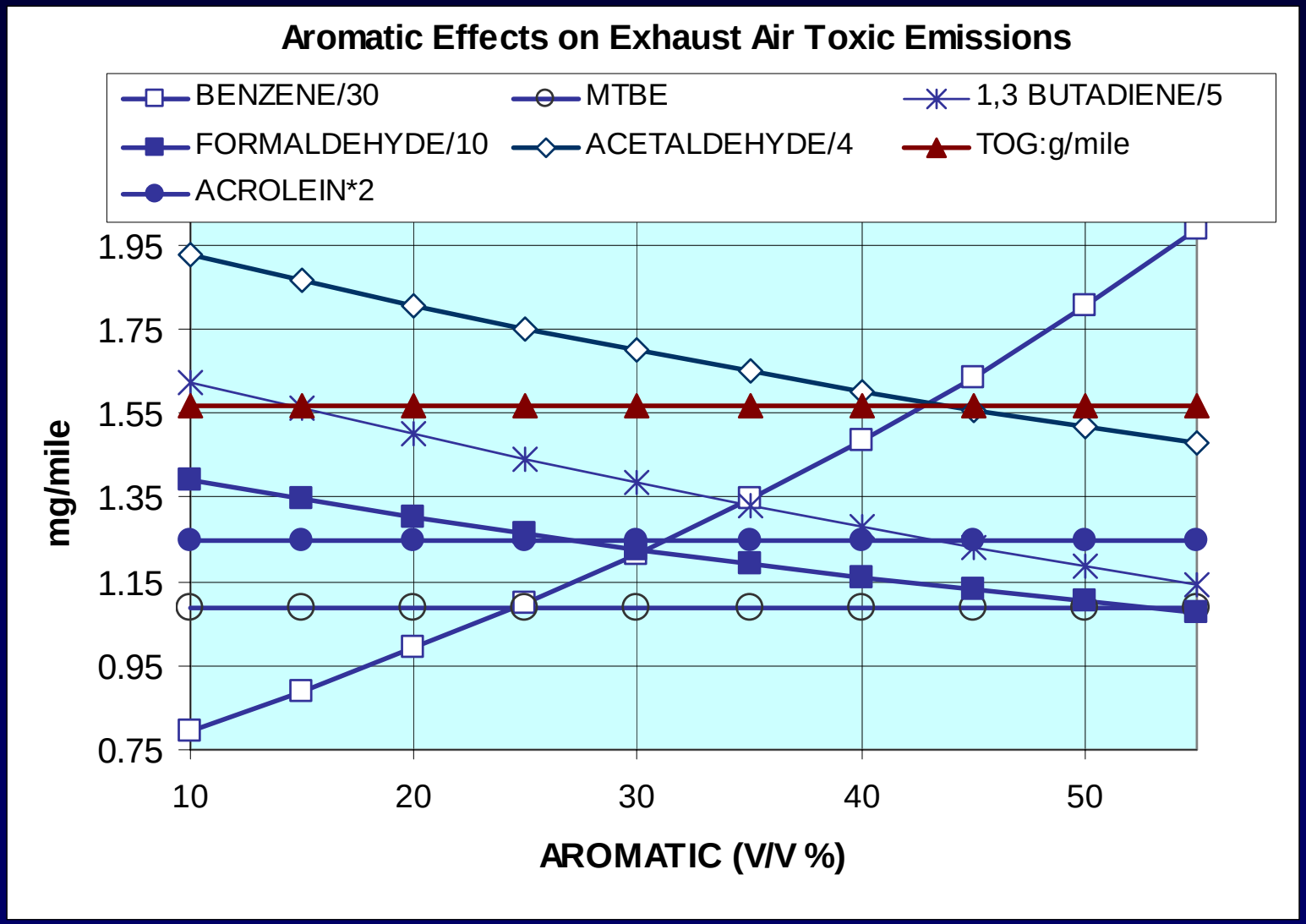
Fuel E300 (Exhaust)



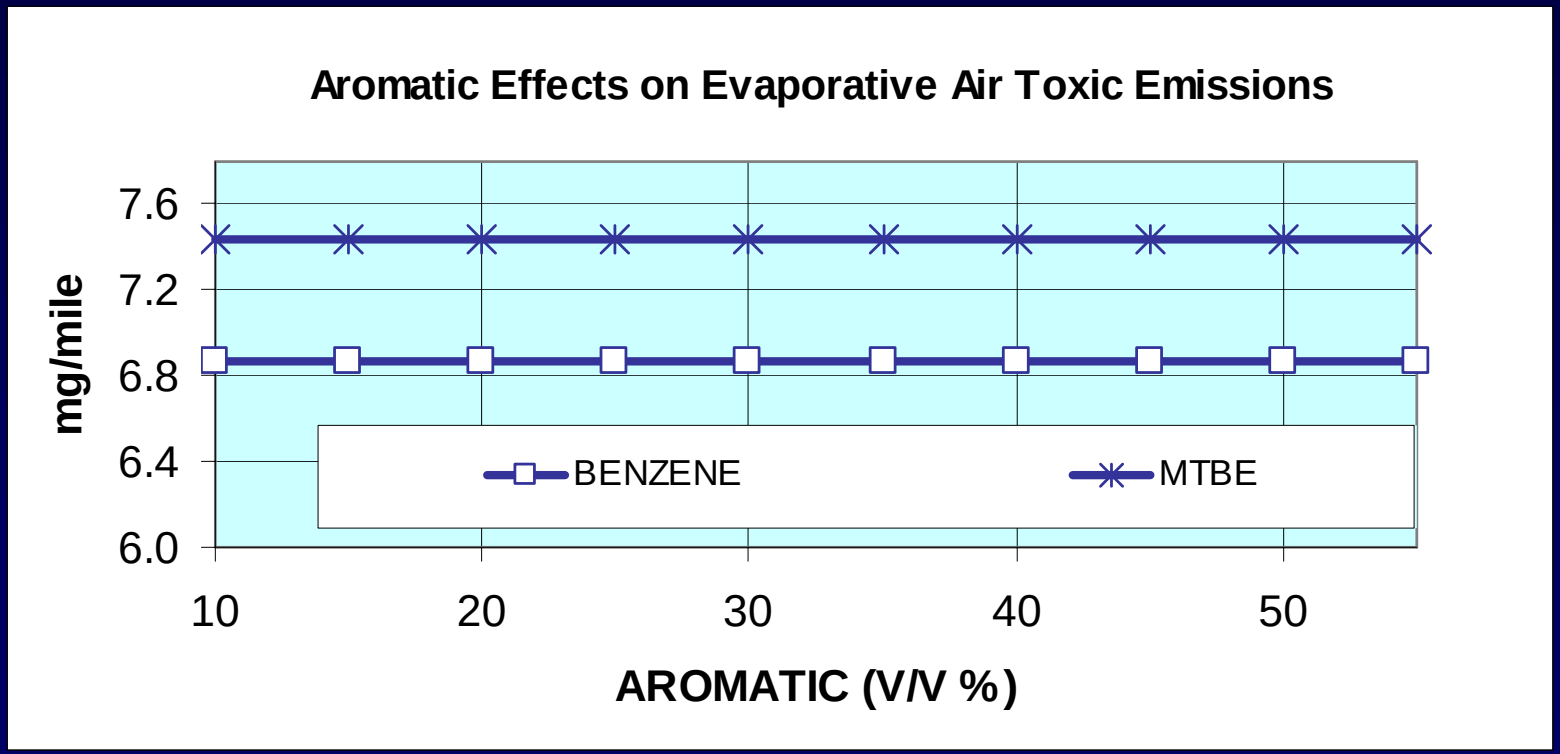
Fuel E300 (Evaporative)



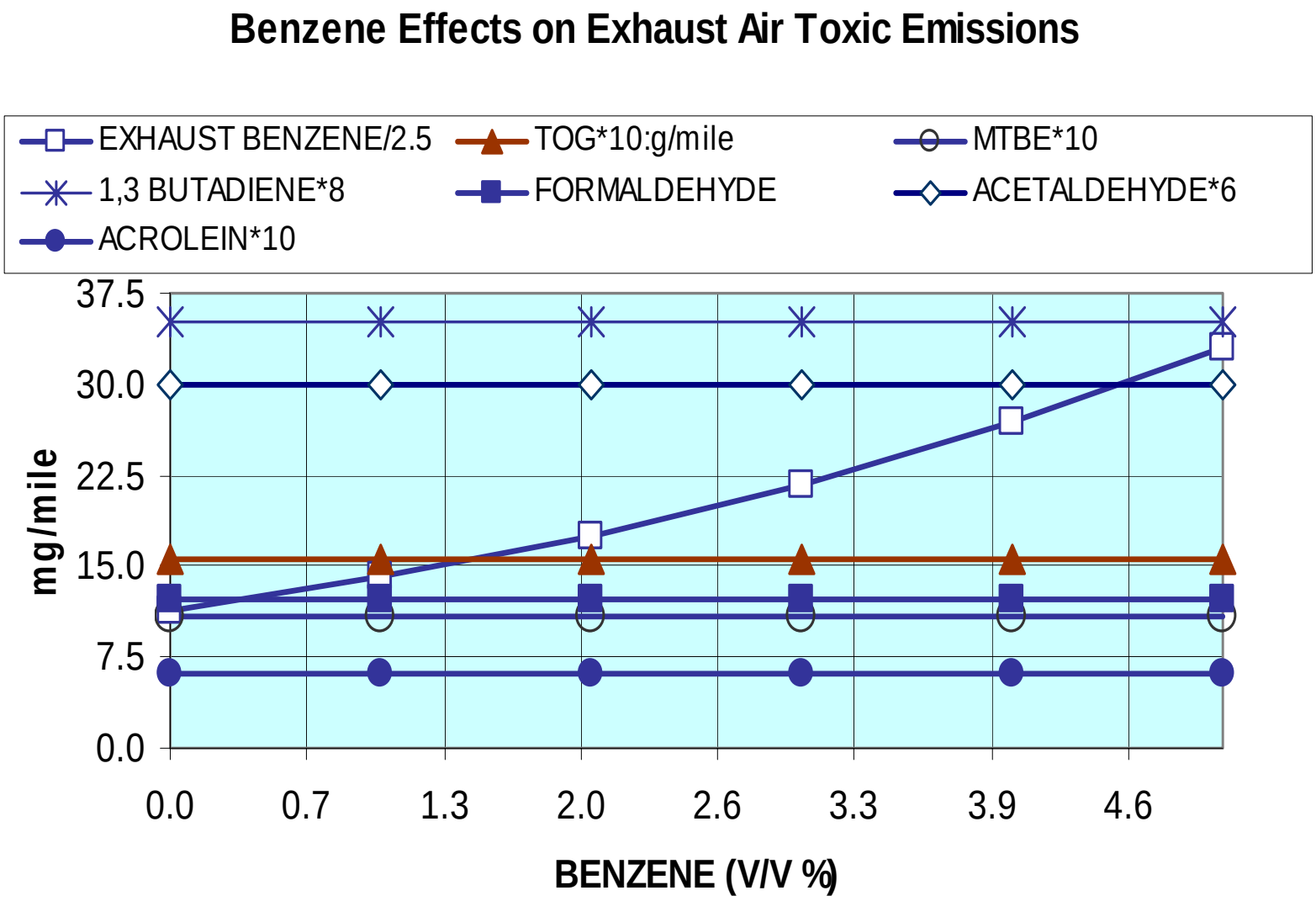
Fuel Aromatic (Exhaust)



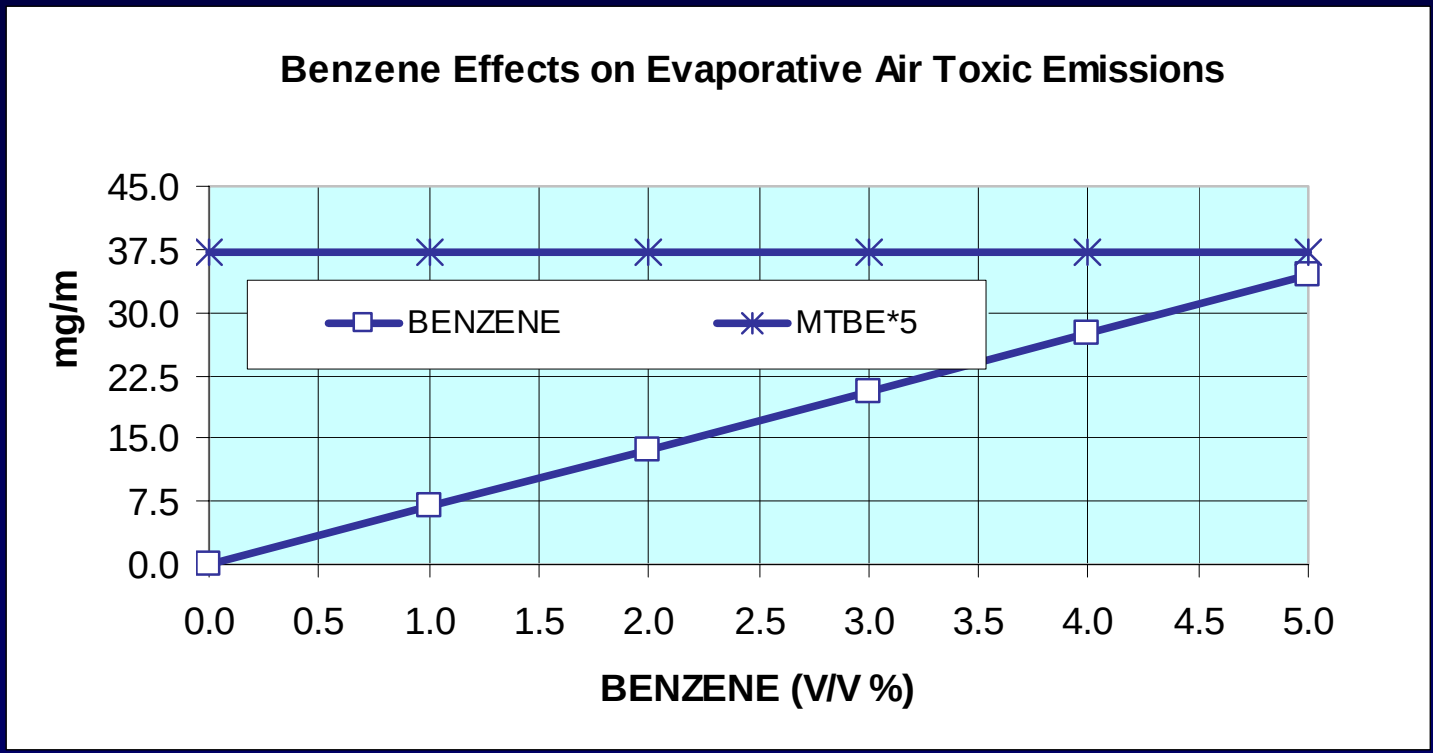
Fuel Aromatic (Evaporative)



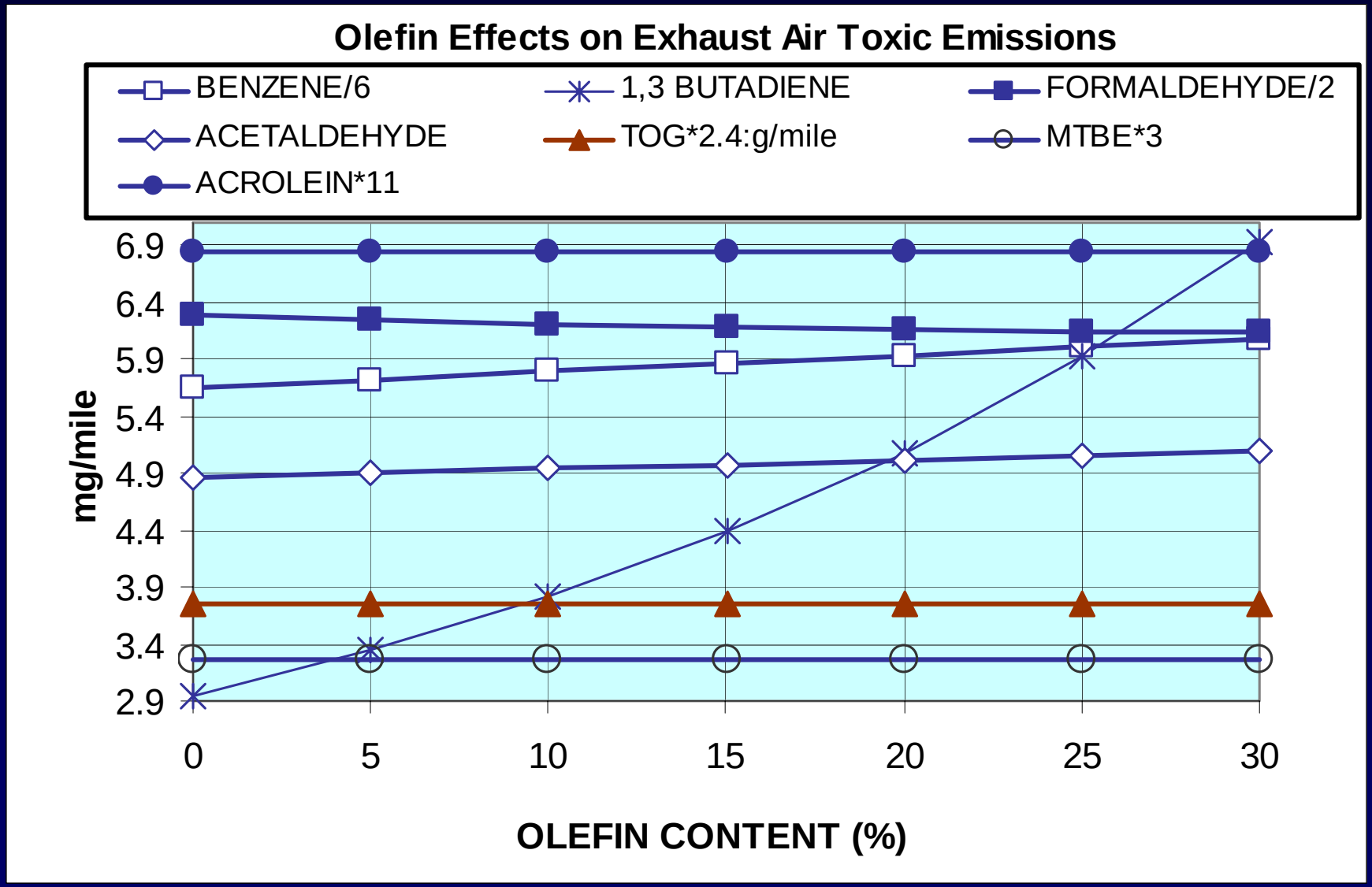
Fuel Benzene (Exhaust)



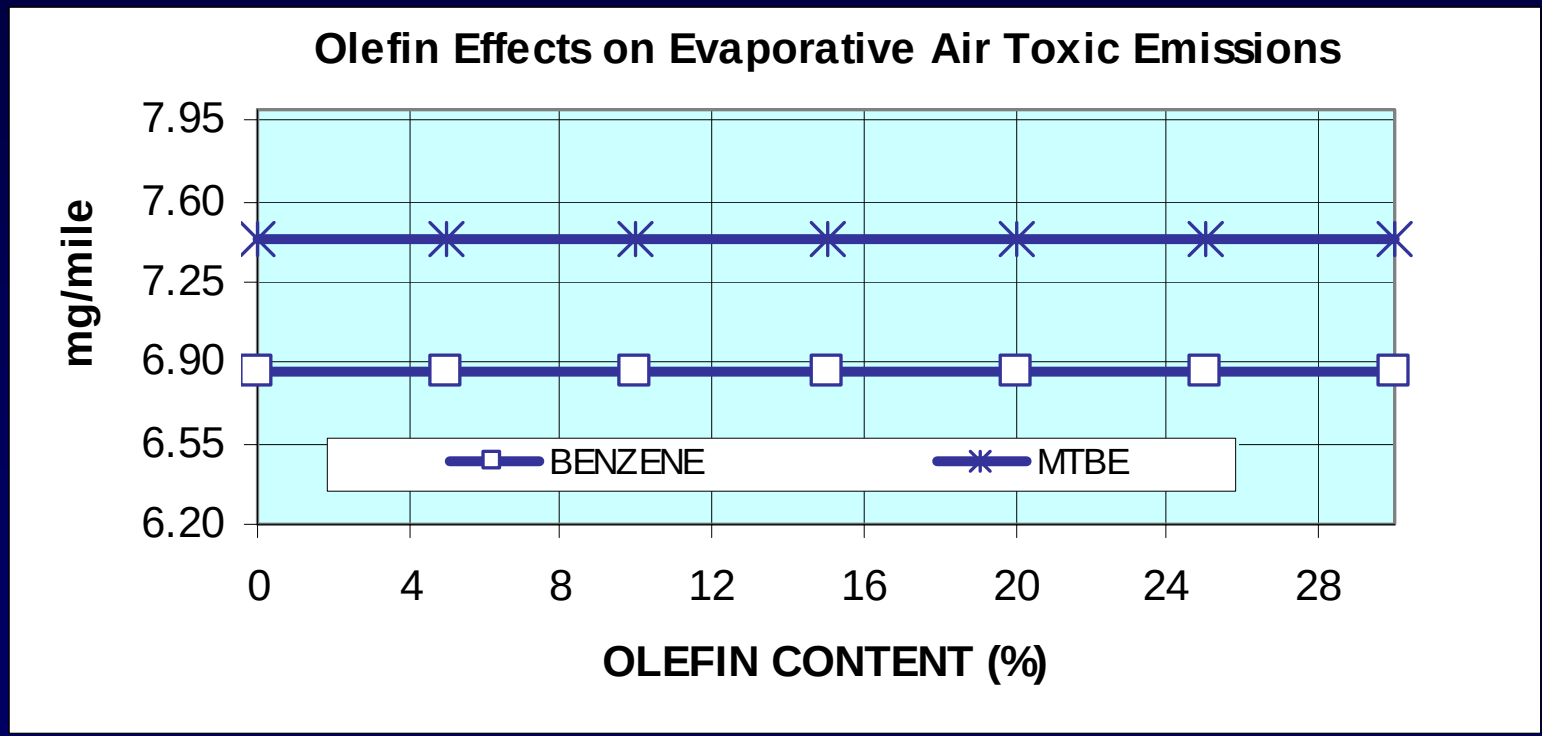
Fuel Benzene (Evaporative)



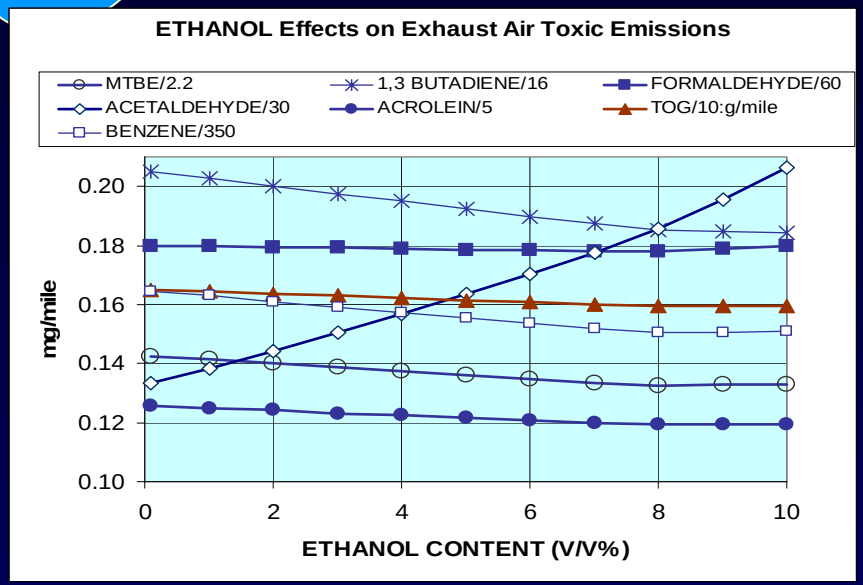
Fuel Olefin (Exhaust)

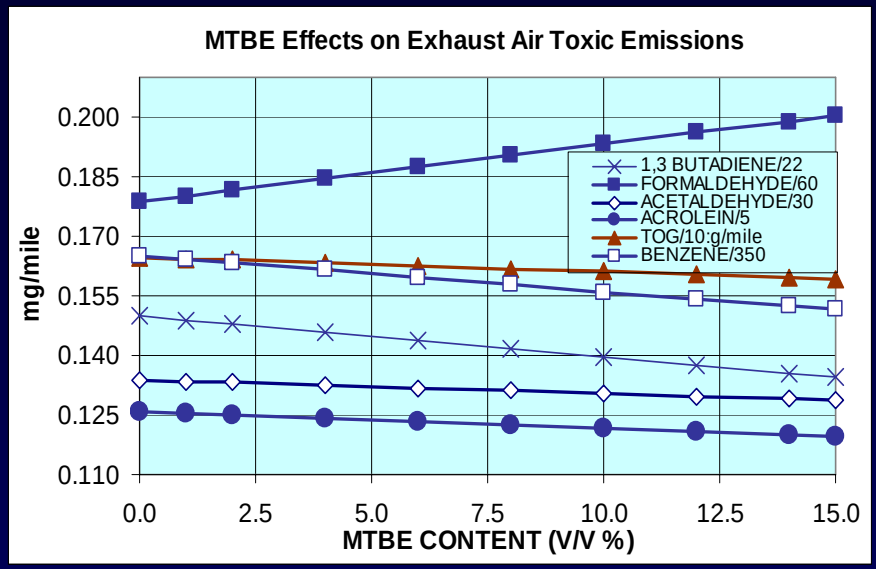


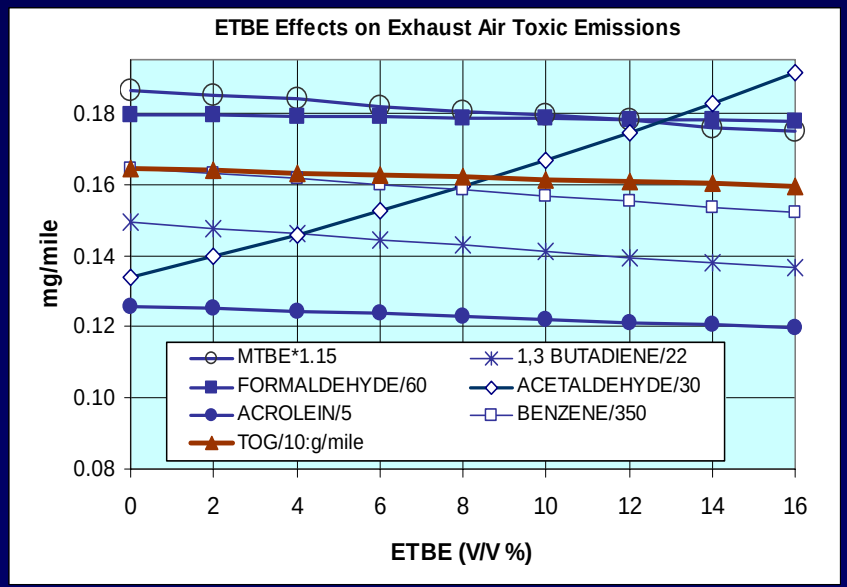
Fuel Olefin (Evaporative)

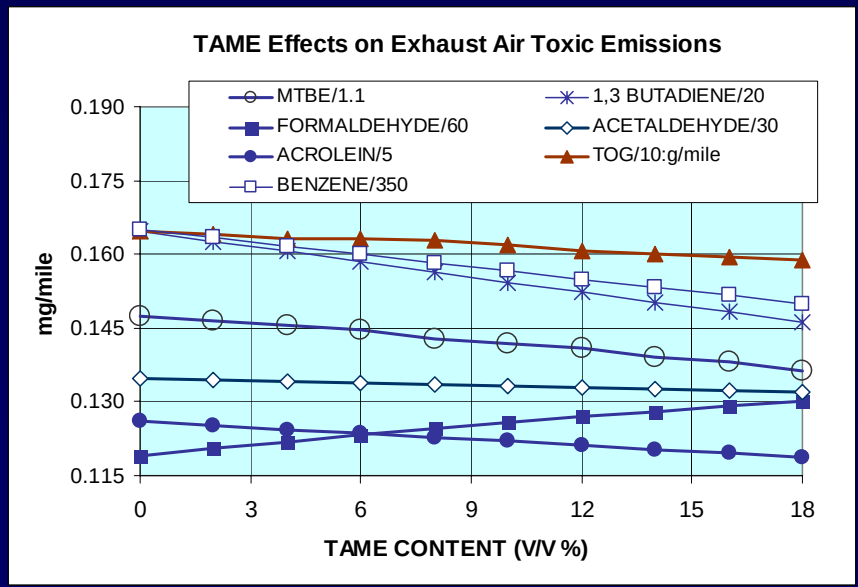


Oxygenated Fuel - Exhaust

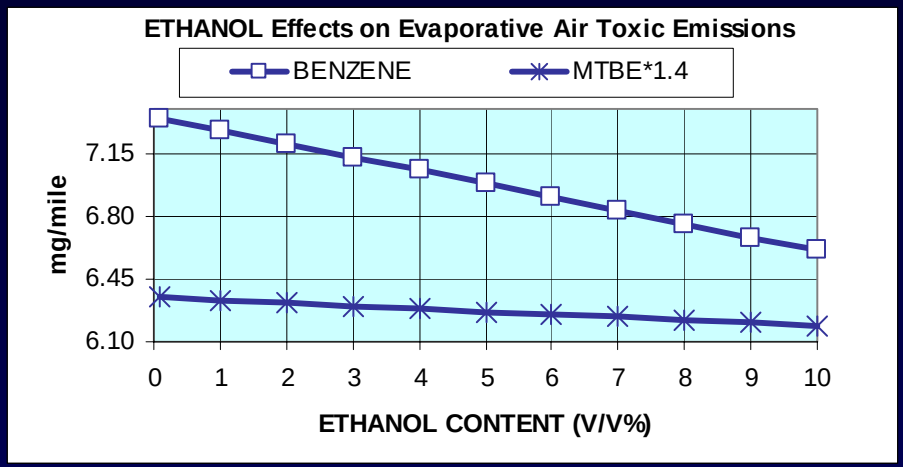


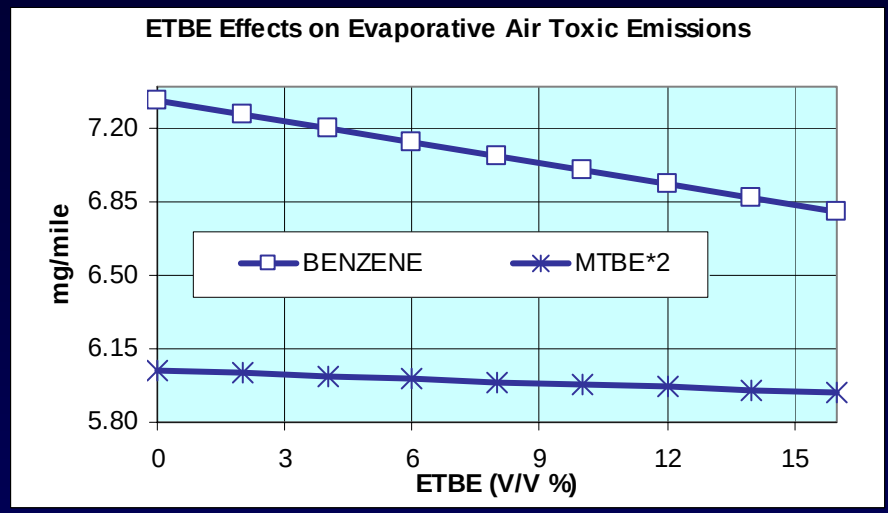


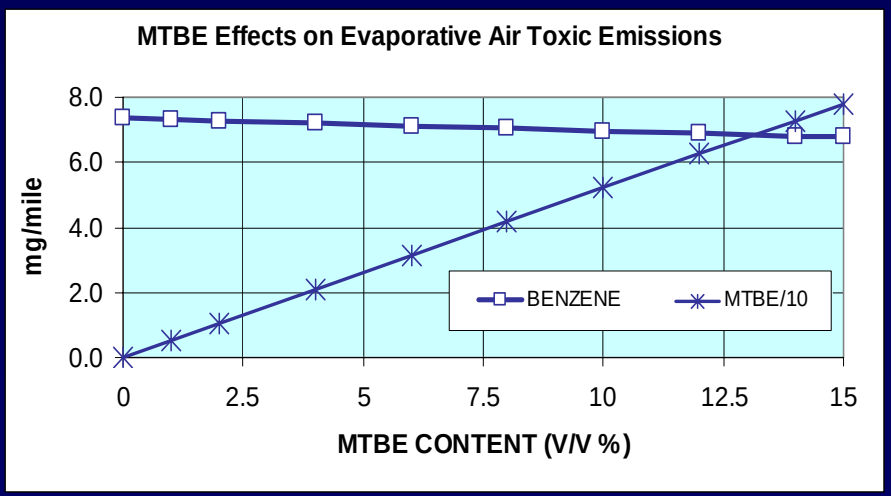


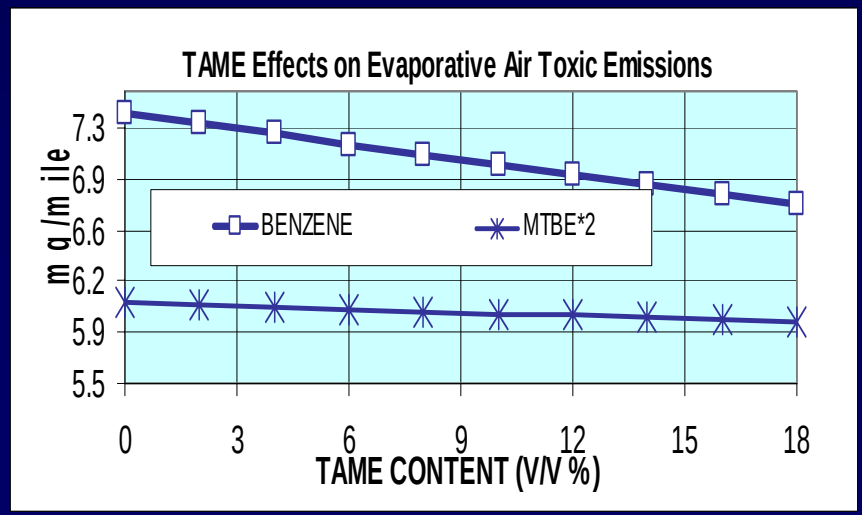


Oxygenated Fuel - Evaporative









Summary

TESTED	EXHAUST EMISSION FACTOR (EF)							EVAPORATIVE EF	
PARAMETER	ACETALDEHYDE	ACROLEIN	BENZENE	1,3 BUTADIENE	FORMALDEHYDE	MTBE	TOG	BENZENE	MTBE
AROMATIC	◔	○	◓	◔	◔	○	○	○	○
A-SPEED(2.5-10.0)	●	●	●	●	●	☀	☀	☀	☀
A-SPEED(10.0-22.5)	◓	◓	◓	◓	◓	◓	◓	◓	◓
A-SPEED(22.5-65.0)	◔	◔	◔	◔	◔	◔	◔	◔	◔
BENZENE	○	○	☀	○	○	○	○	☀	○
E200	◔	○	○	◔	○	○	○	○	○
E300	◔	○	◔	◔	○	○	○	○	○
ETBE	◓	◔	◔	◔	○	◔	○	◔	○
ETHANOL	◓	◔	◔	◓	○	◔	◔	◔	◔
F-SPEED(2.5-10.0)	●	●	●	●	●	●	☀	☀	☀
F-SPEED(10.0-22.5)	◓	◓	◓	◓	◓	◓	◓	◓	◓
F-SPEED(22.5-65.0)	◔	◓	◔	◔	◔	◔	◓	◓	◔
GAS-S	○	○	○	○	○	○	○	○	○
HUMIDITY	○	○	○	○	○	○	○	○	○
MAX.TEMPERATURE	○	○	○	○	○	○	◓	◓	◓
MIN.TEMPERATURE	◔	◔	◔	◔	◔	◔	○	◔	◔
MTBE	◔	◔	◔	◔	◔	●	◔	◔	●
OLEFIN	○	○	◔	◕	◔	○	○	○	○
RVP(6.5-8.5)	◓	○	◓	◓	◓	◔	☀	●	◔
RVP(8.5-12.5)	☀	☀	☀	☀	●	☀	☀	☀	☀
RVP(12.5-15.0)	◔	◔	☀	☀	◔	◓	◓	◕	●
TAME	○	◔	◔	◔	◔	◔	◔	◔	○
VMT RATIO(A vs.L)	◔	◔	◔	◔	◔	◔	◔	◔	◔
VMT RATIO(F vs. A)	○	○	○	○	○	○	○	○	○
YEAR(2002-2006)	☀	☀	●	☀	☀	☀	●	◕	◕
YEAR(2006-2011)	●	●	◕	●	●	☀	●	●	●
YEAR(2011-2020)	◕	◕	◕	◕	◕	◕	◕	●	●

○ :Percentage of an emission factor change as a result of one unit increase of tested parameter is < 0.2%.

Conclusion

1. Evaporative Emission
2. Exhaust Emission

Next Session