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Federal Highway Administration

Analysis of MOBILE6.2's PM Emission Factor Estimating Function

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Federal Highway Administration

Introduction

- EPA's approval of the MOBILE6.2 emissions factor model is effective May 19, 2004.
- M6.2 particulate matter (PM) module replaces PART5 (1995).

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 51

[FRL–7663–6]

Official Release of the MOBILE6.2 Motor Vehicle Emissions Factor Model and the December 2003 AP–42 Methods for Re-Entrained Road Dust

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of availability.

SUMMARY: EPA is approving and announcing the availability of the MOBILE6.2 motor vehicle emissions factor model for official use in particulate matter (PM_{10} and $PM_{2.5}$) SIPs and transportation conformity determinations outside of California. MOBILE6.2 is an update to MOBILE6 which adds the capability to estimate direct exhaust and brake and tire wear particulate matter emission factors for PM_{10} and $PM_{2.5}$, and exhaust emission factors for particulate precursors to the MOBILE6 model. MOBILE6.2 is a

entrained road dust is effective May 19, 2004. See below for further information regarding how today's approval starts time periods after which MOBILE6.2 and the December 2003 AP–42 methods are required in new transportation conformity analyses and certain SIP and motor vehicle emissions budget revisions.

FOR FURTHER INFORMATION CONTACT: If you have questions on this notice, please send an e-mail to EPA at *mobile@epa.gov* or contact EPA at (734) 214–4636 for technical model questions about MOBILE6.2. Please send an e-mail to EPA at *info.chief@epa.gov* or contact EPA at (919) 541–1000 for technical questions about the December 2003 AP–42 methods.

SUPPLEMENTARY INFORMATION:

Availability of Models and Support Materials

Copies of the official version of the MOBILE6.2 model are available on EPA's MOBILE Web site, *http://www.epa.gov/otaq/m6.htm*. The MOBILE Web site also contains the

You can remove yourself from the list by sending another message to the listserver address. This message must be sent from the same e-mail address that you used to subscribe, and should contain the message: unsubscribe EPA-MOBILENEWS.

Copies of the official version of the December 2003 edition of Sections 13.2.1 and 13.2.2 of AP–42 can be found at *www.epa.gov/ttn/chief/ap42/ch13/index.html*. In the rest of this document, unless otherwise indicated, "AP–42" refers to the December 2003 edition of Sections 13.2.1 and 13.2.2 of AP–42.

I. What Is MOBILE6.2 and How Is It Different From MOBILE6?

MOBILE is an EPA emissions factor model for estimating pollution from on-road motor vehicles in states outside of California. The model accounts for the emission impacts of factors such as changes in vehicle emission standards, changes in vehicle populations and activity, and variation in local conditions such as temperature, humidity, fuel quality, and air quality programs.

Outline

- PART5 vs. MOBILE6.2 Comparison
  - Model Year
  - Speed
- Sensitivity analysis of MOBILE6.2
  - VMT by Facility
  - Roadway Facility Speed Effects
  - Gasoline Sulfur Content
  - Diesel Sulfur Content
  - Minimum and Maximum Temperature
  - Fuel RVP Effects
- Conclusions

PART5 vs. MOBILE6.2 Comparison

Comparison of M6.2 and PART5

M6.2 Pollutants	Part5 Pollutants	Description [Sources: PART5 and M6.2 users manuals]
OCARBON (Organic CO)	SOF (soluble organic fraction)	Organic Carbon of diesel exhausts particulate emissions. Other than name change, no other change was done.
ECARBON (Elemental & residual CO)	RCP (remaining carbon portion).	Elemental and residual Carbon of diesel exhausts particulate emissions. Other than name change, no other change was done.
GASPM	Carbon	Organic, elemental, and residual Carbon of gasoline exhausts particulate emissions.
SO_4	DIS	Direct Gasoline Sulfate Particle emissions: same algorithm, but now M6.2 calculations account for different fuel sulfur content.
Not available	INS	Indirect sulfate: sulfate formed in the air from vehicle emissions. In PART5 it is calculated based on measurements of ambient sulfur from 11 cities in the US. It also assumes that 12% of gaseous SO_2 reacts in the atmosphere to form SO_4.

Comparison of M6.2 and PART5 (cont.)

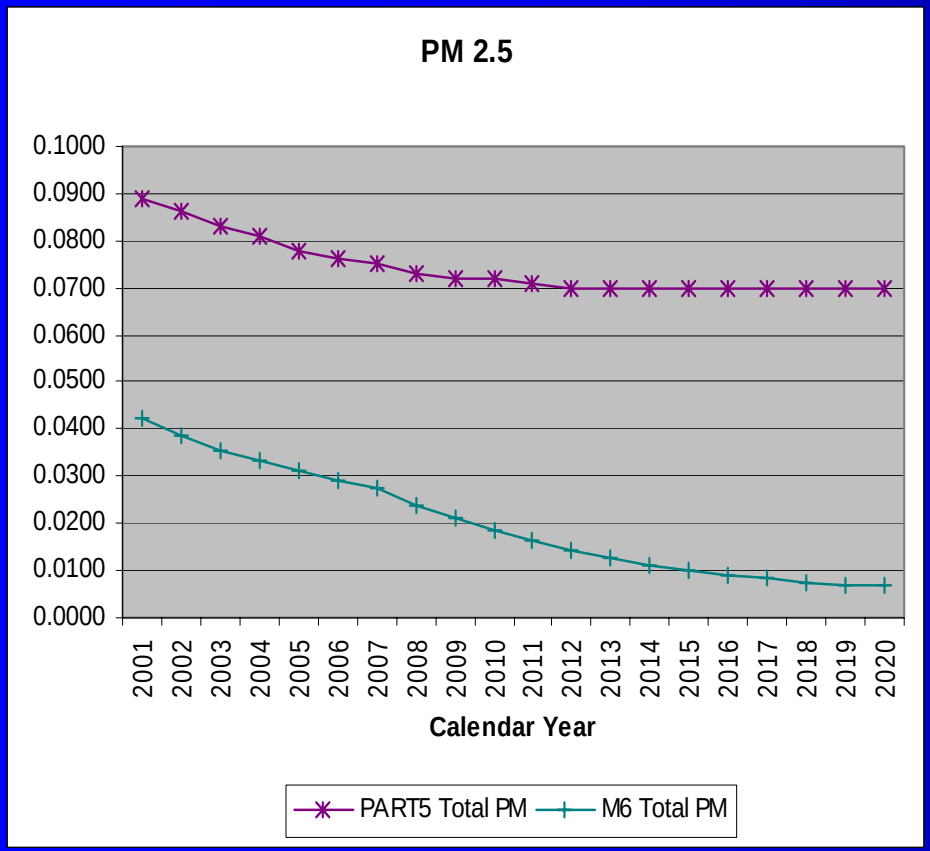
M6.2 Pollutants	Part5 Pollutants	Description [Sources: PART5 and M6.2 users manuals]
Lead	Lead	Gasoline Lead particulate emissions based on fuel content. Both models assume that post 1975 model year vehicles, and after 1991 calendar years, are free of lead.
NH3	Not Available	Only gaseous ammonia directly emitted directly from a vehicle tailpipe are considered in Ammonia emission factors. Estimates are based in a 1981 report (EPA/AA/CTAB/PA/81-20).
BRAKE	BRAKE	PM emission factors from brake wear. The brake wear calculation portion of PART5 was not updated.
TIRE	TIRE	PM emission factors from tire wear. The tire wear calculation portion of PART5 was not updated.
Total PM	Total PM	Total PM includes: exhaust PM, indirect sulfate, brake-wear and tire-wear.

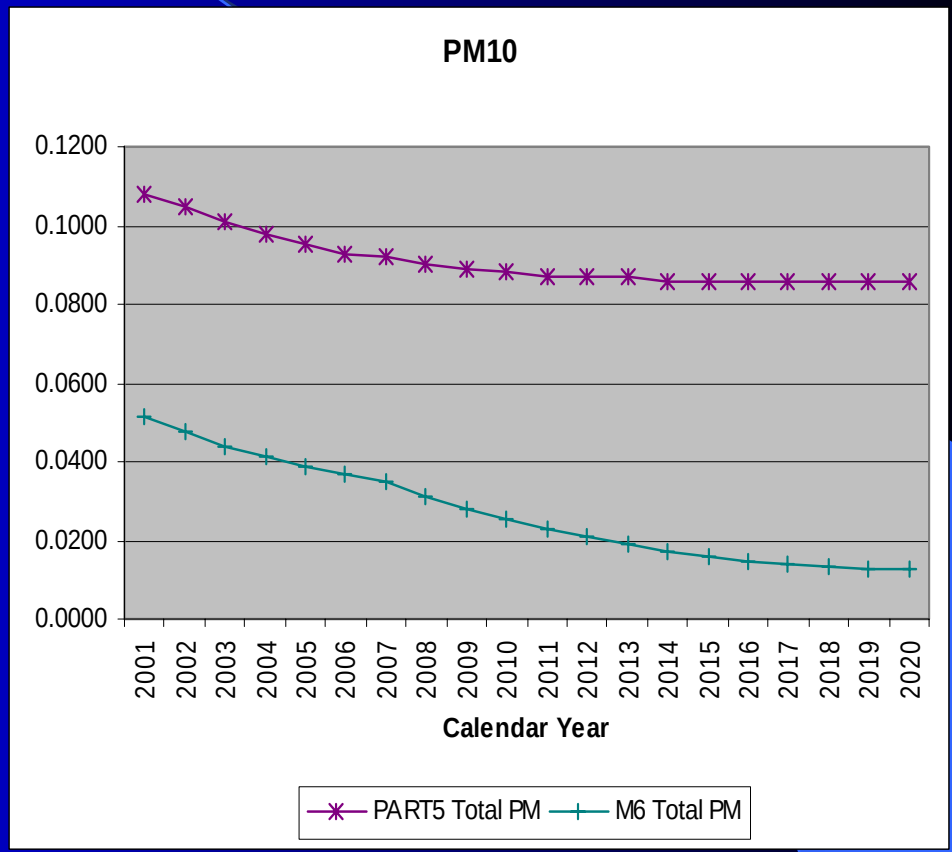
Comparison of M6.2 and PART5 (cont.)

M6.2 Pollutants	Part5 Pollutants	Description [Sources: PART5 and M6.2 users manuals]
Not available	Fleet average unpaved road dust	PART5's calculation of fugitive dust from paved and unpaved roads was removed in M6.2.
Not available	Fleet average paved road dust	
SO_2	SO_2	Gaseous Sulfur Dioxide: same algorithm, but now M6.2 calculations account for different fuel sulfur content.

Comparison of M6.2 and PART5

Emissions Comparison by Calendar Years





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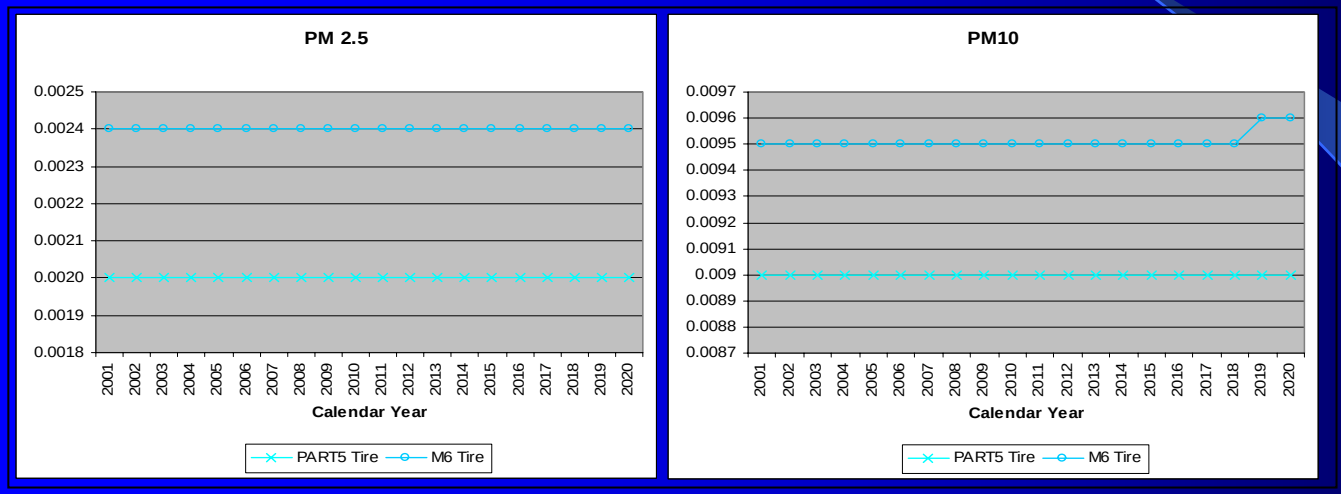
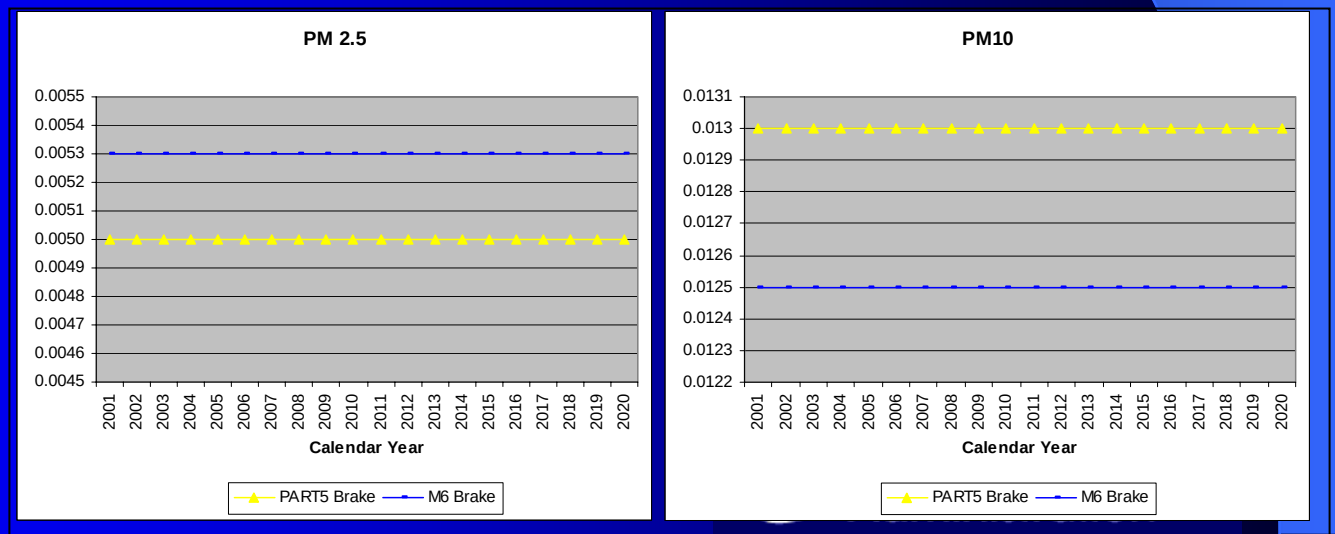
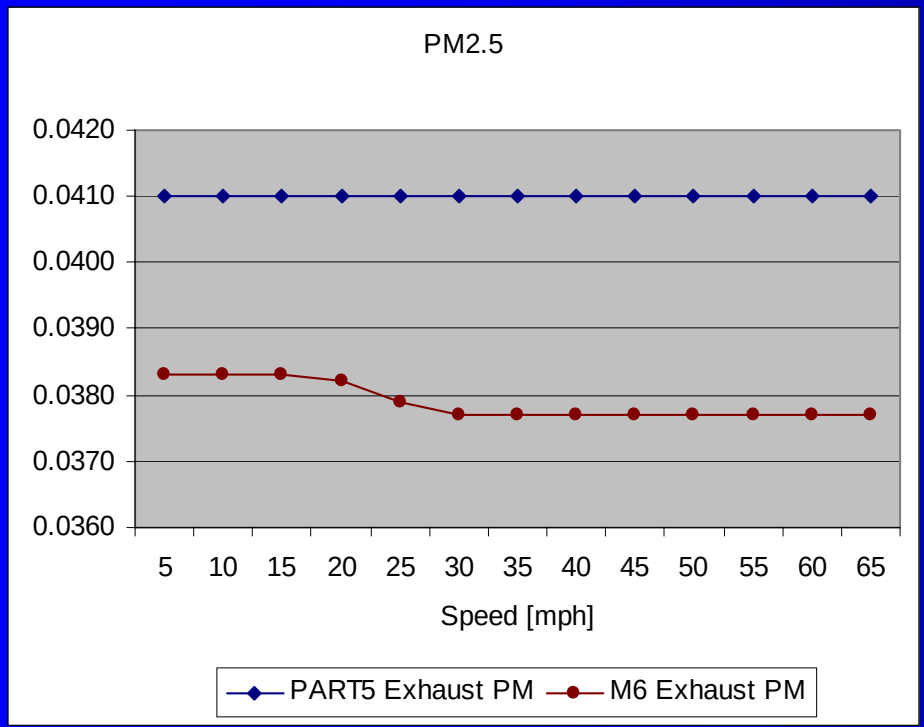
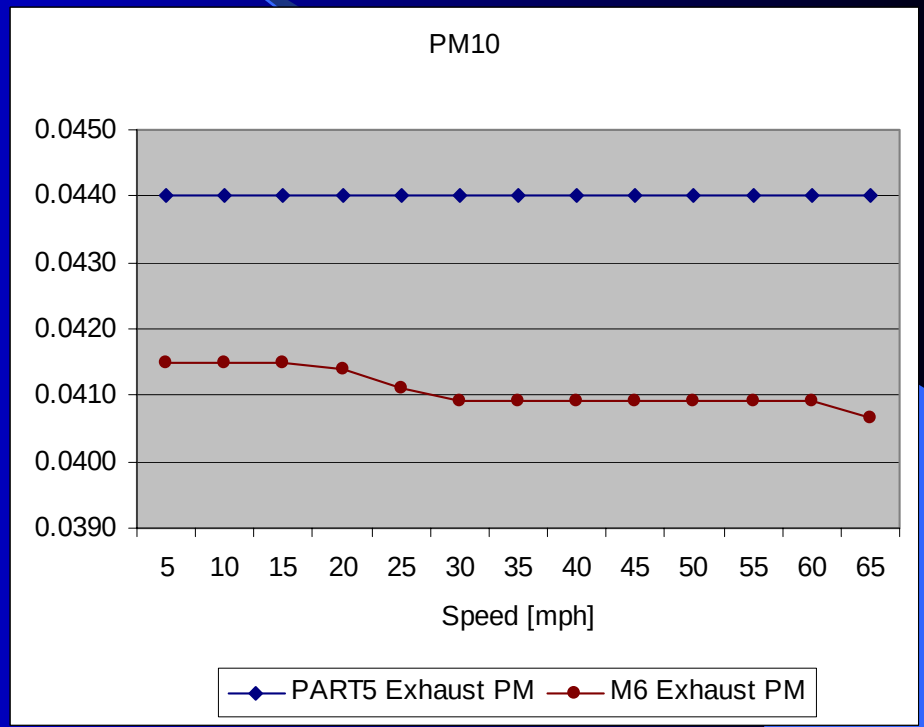
Tire Wear and Break Wear Emissions by Calendar Year





Emissions Comparison by Speed





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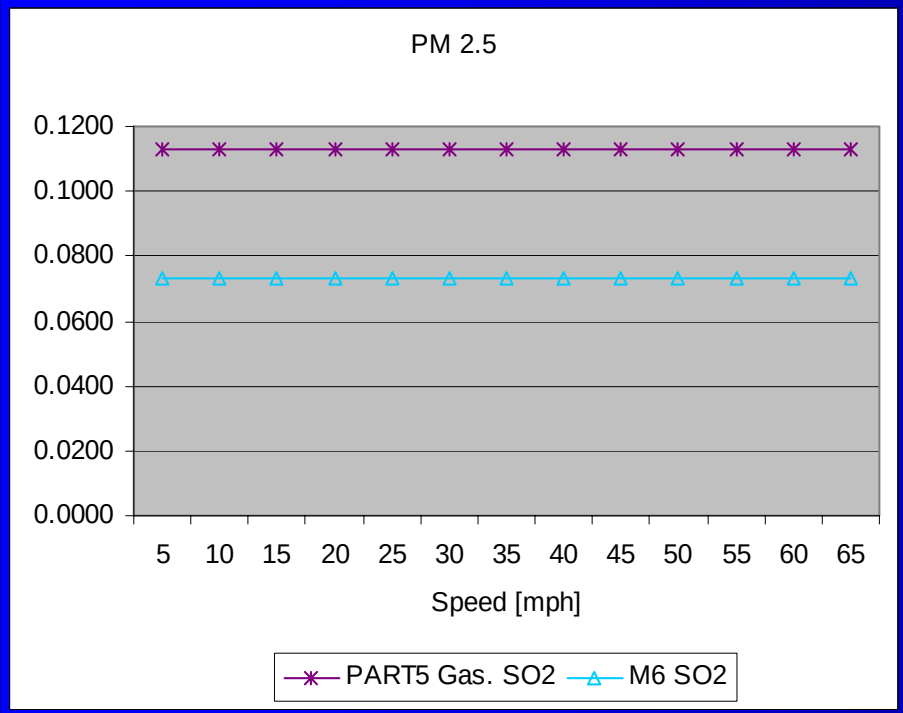
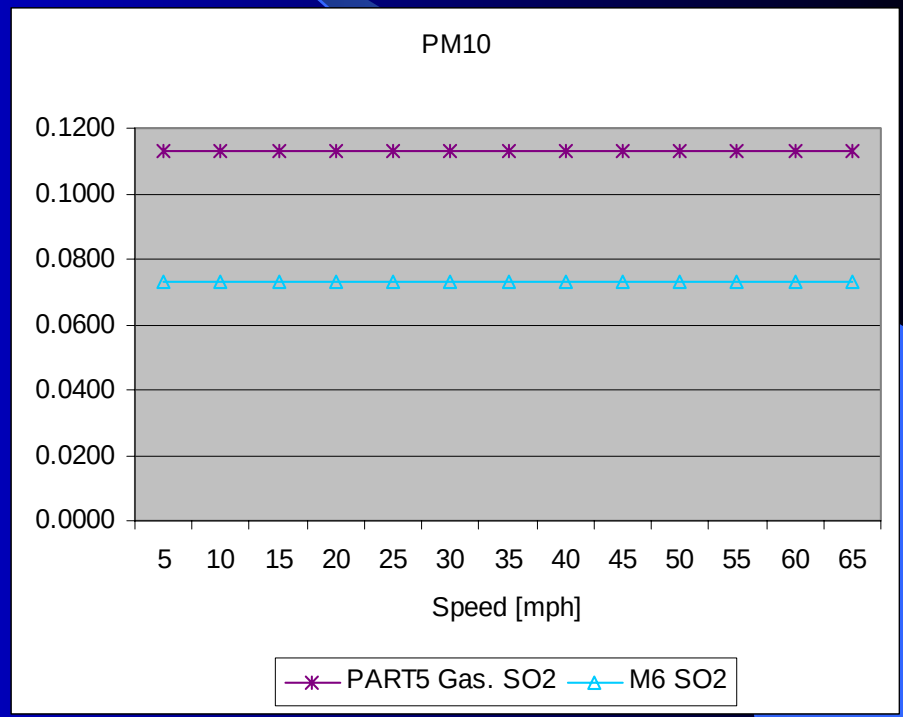
Emissions Comparison by Speed





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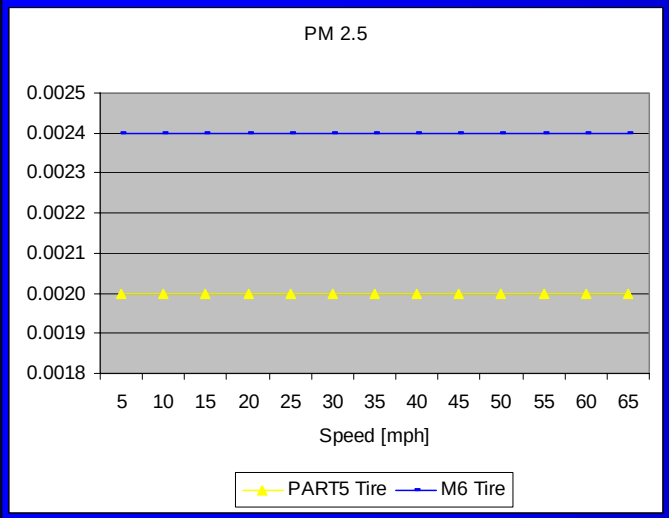
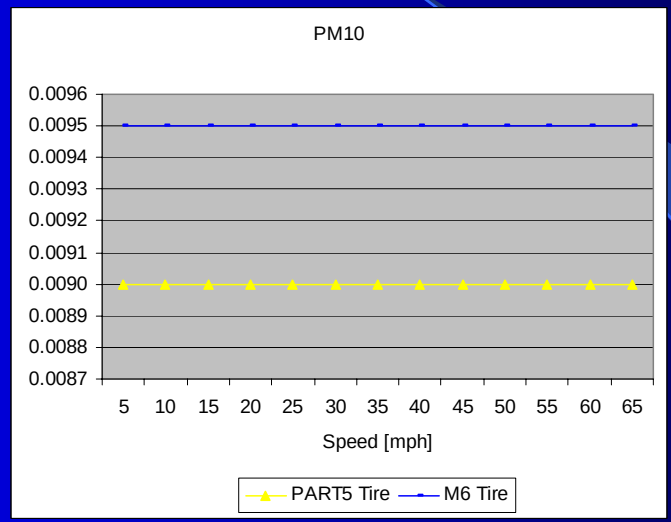
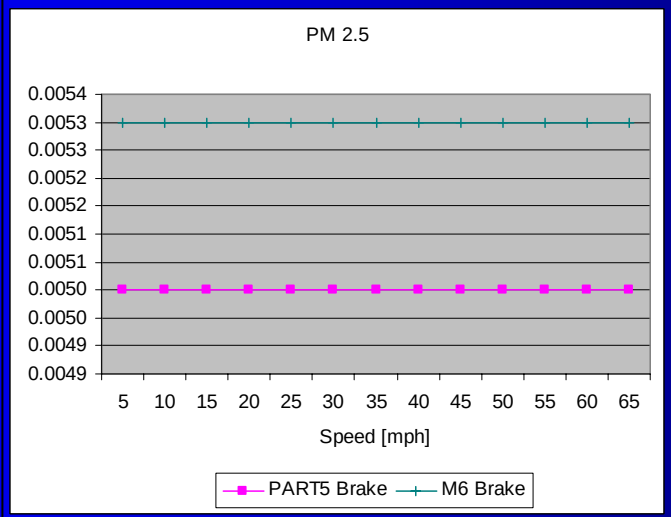
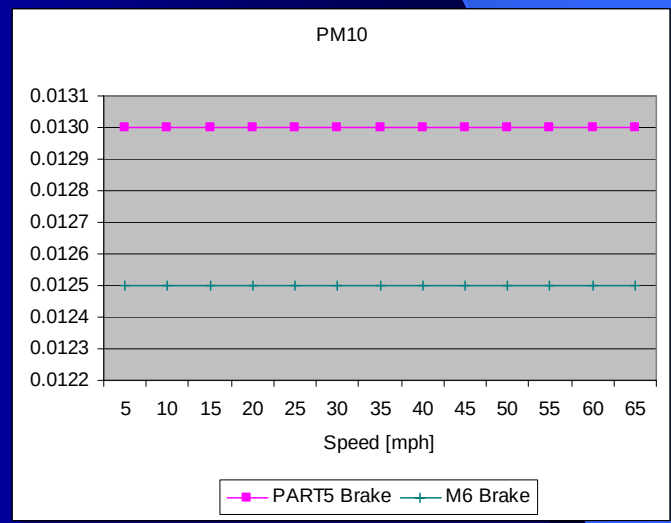
Tire Wear and Break Wear Emissions by Speed



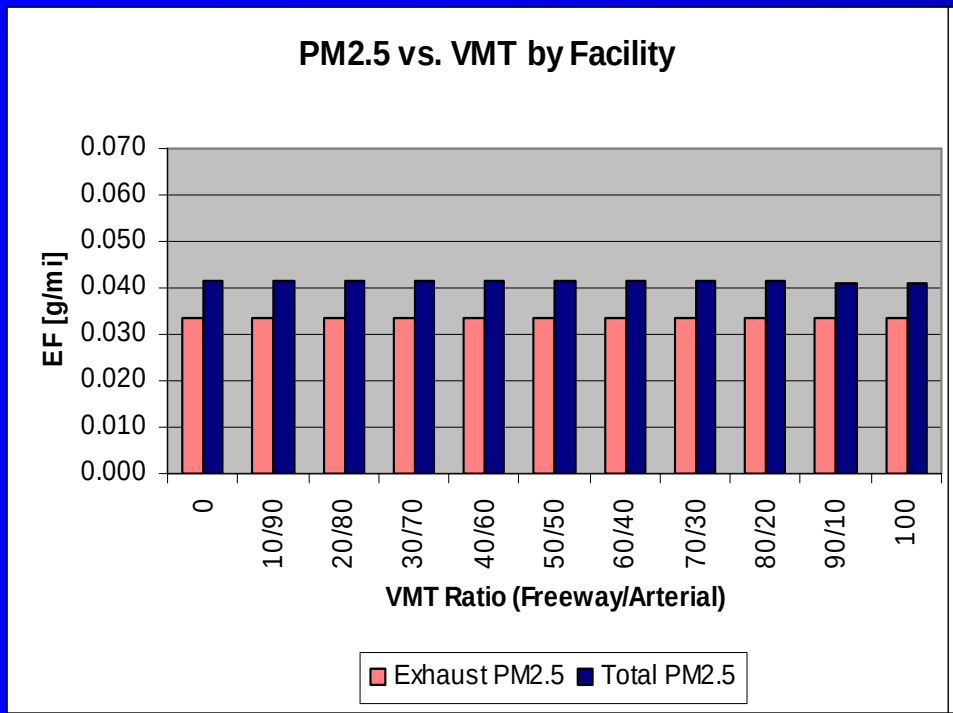


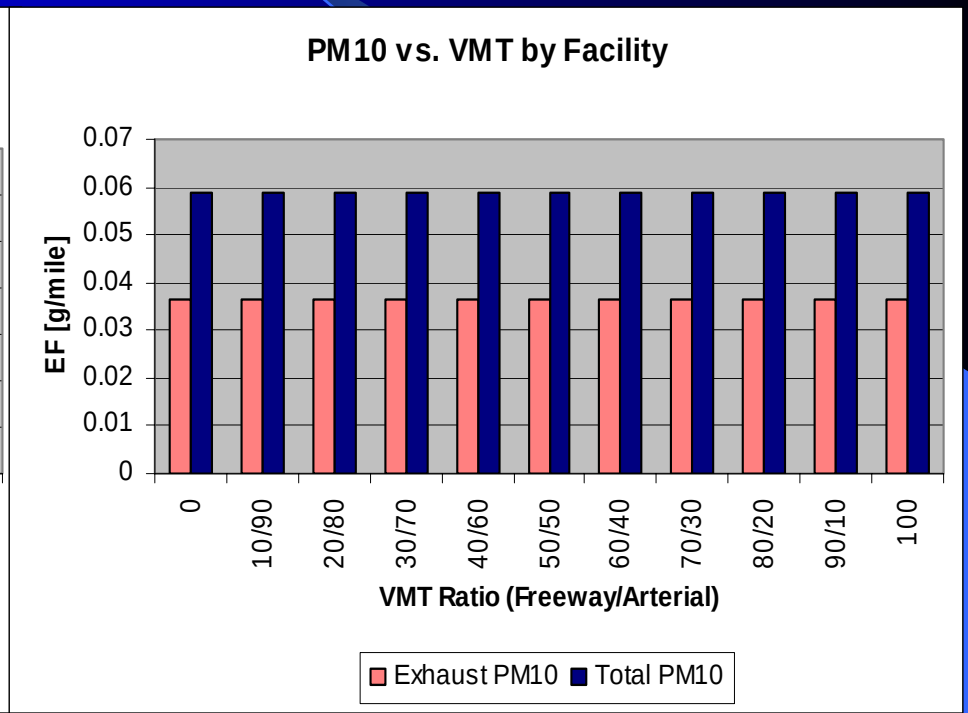




Sensitivity Analysis of MOBILE6.2

Vehicles Miles Traveled by Facility





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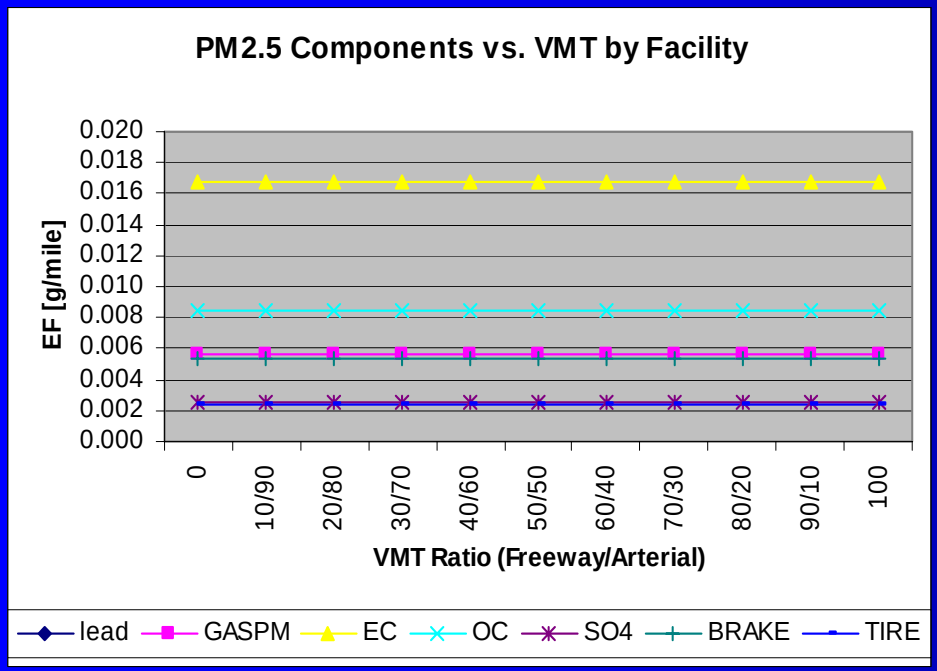
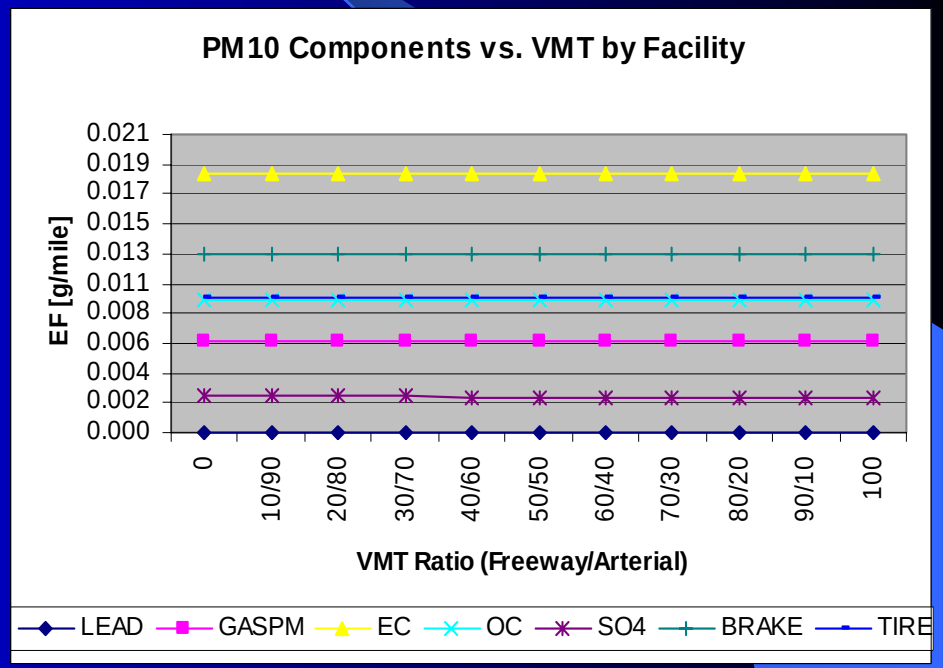
PM Components by Facility





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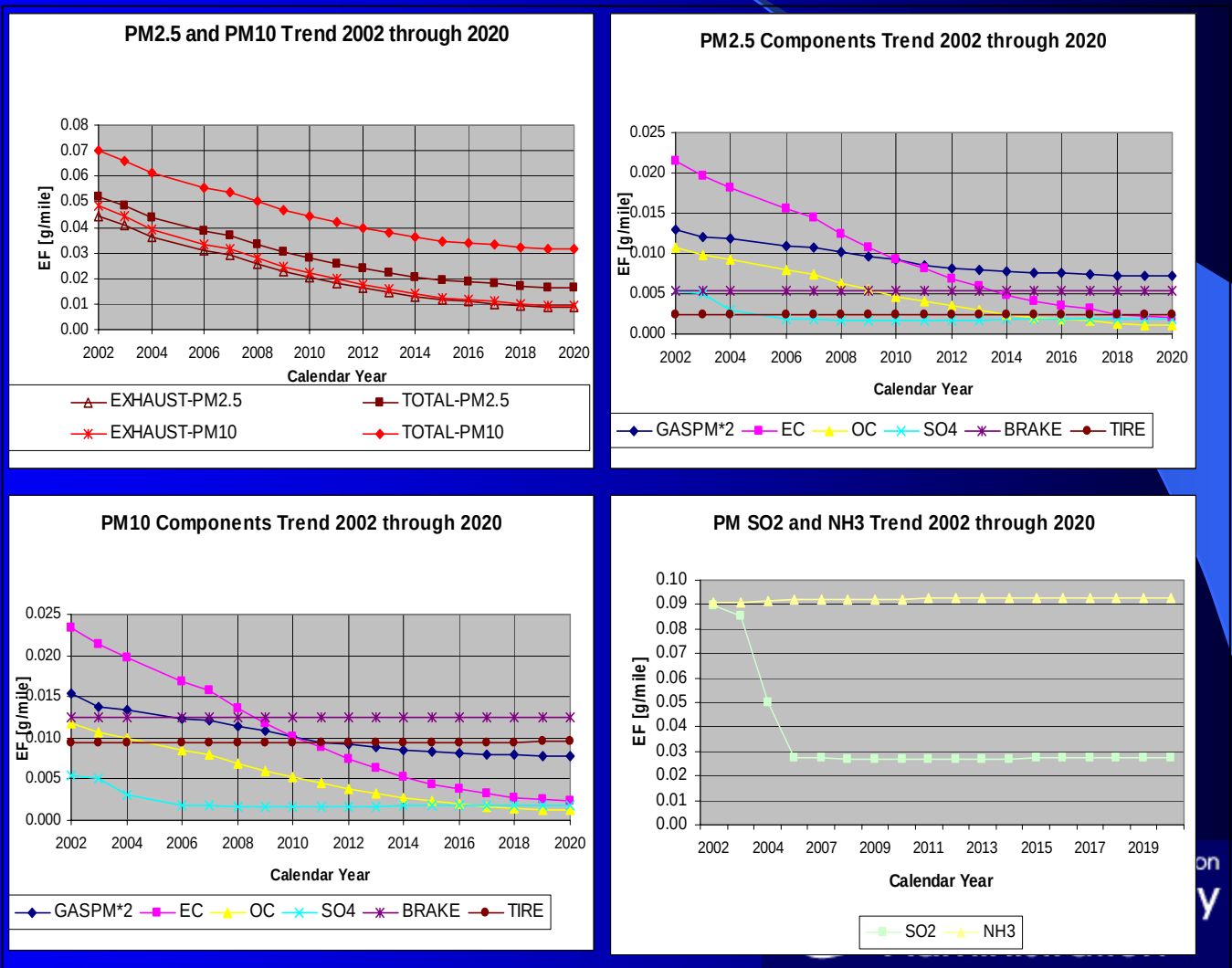
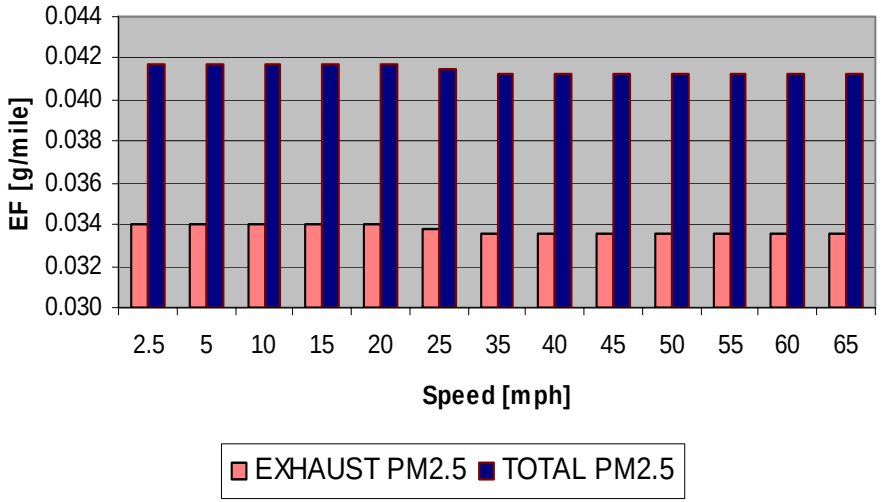
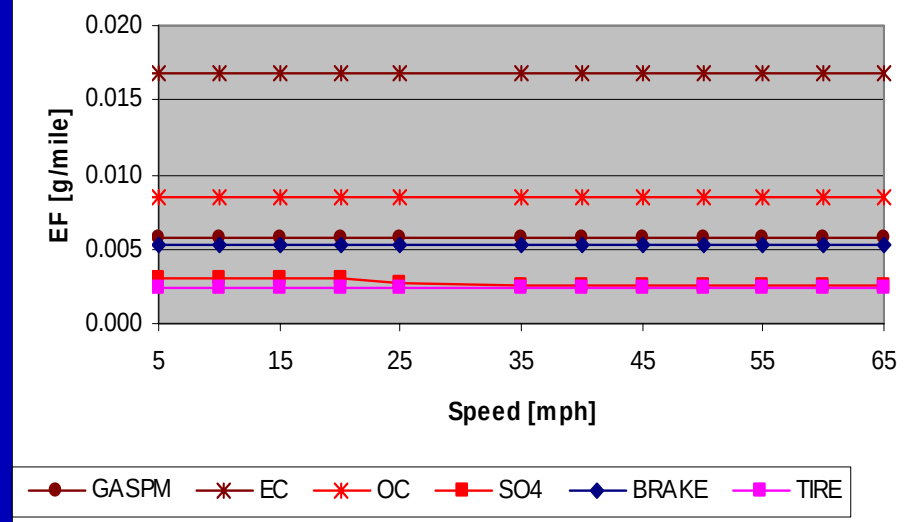
PM Trends by Calendar Year



Roadway Facility Speeds (PM2.5)





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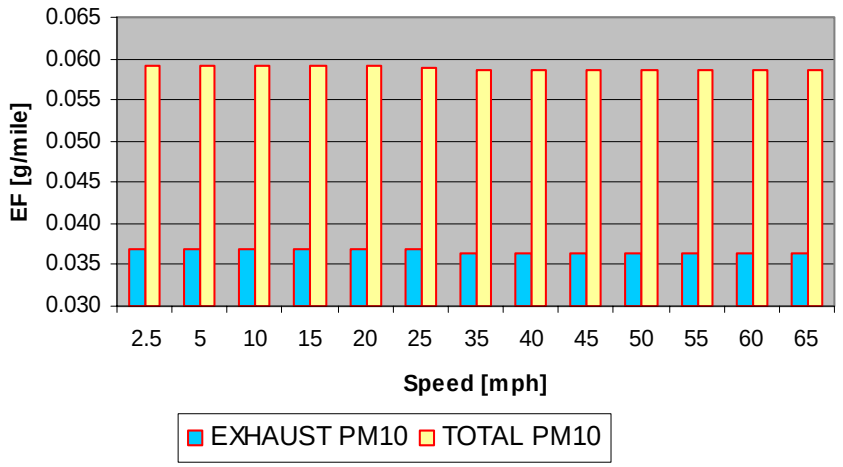
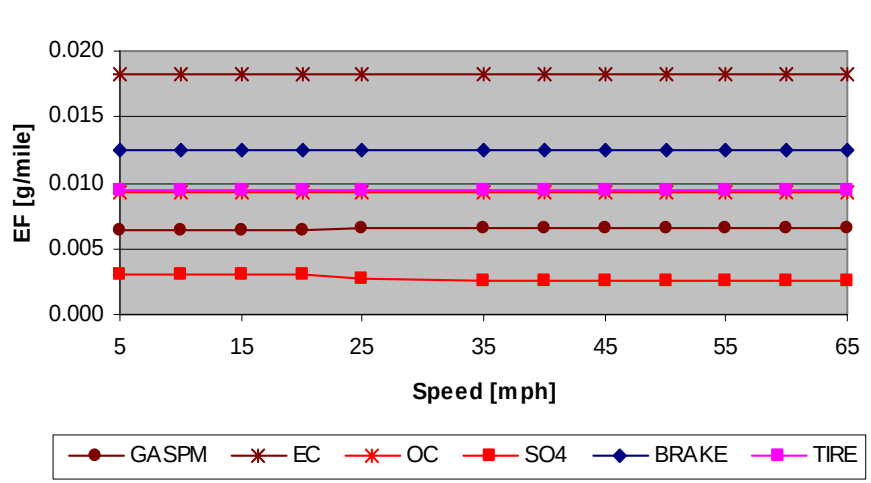
Roadway Facility Speed (PM10)





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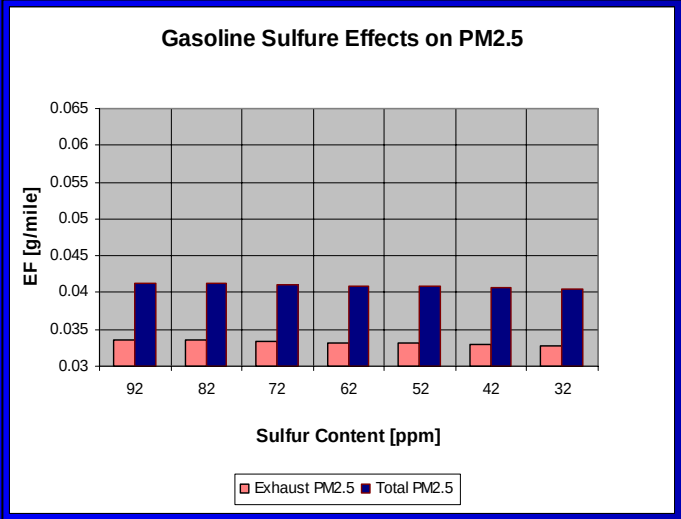
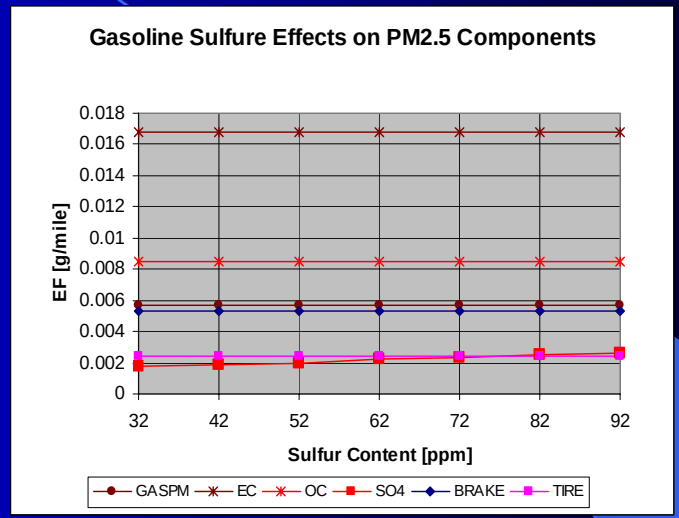
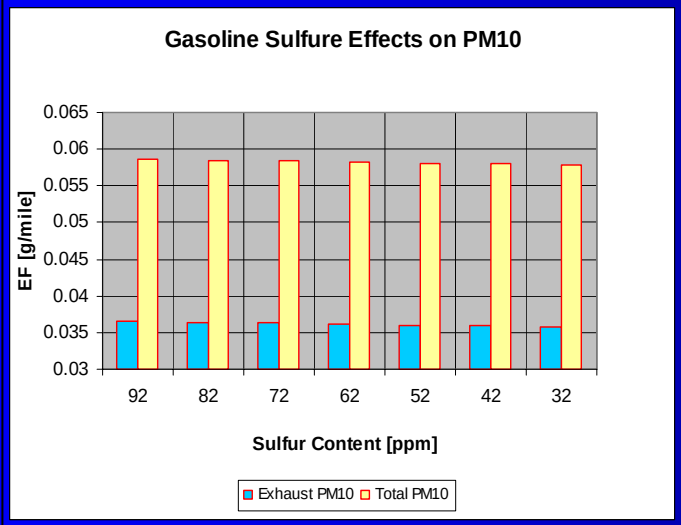
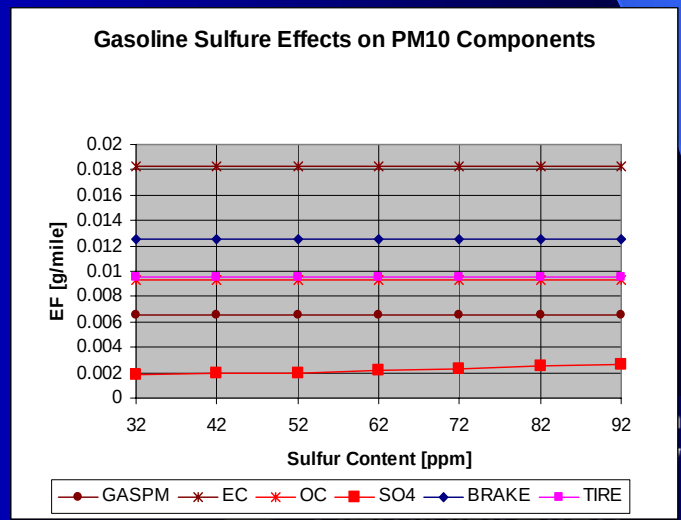
Gasoline sulfur effects

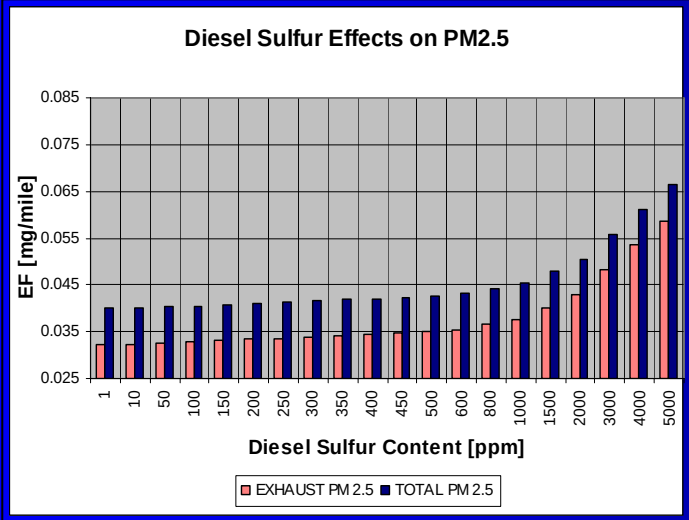


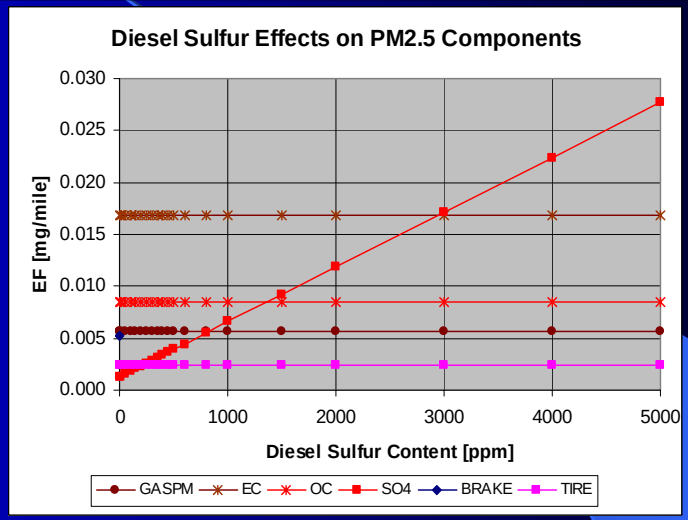


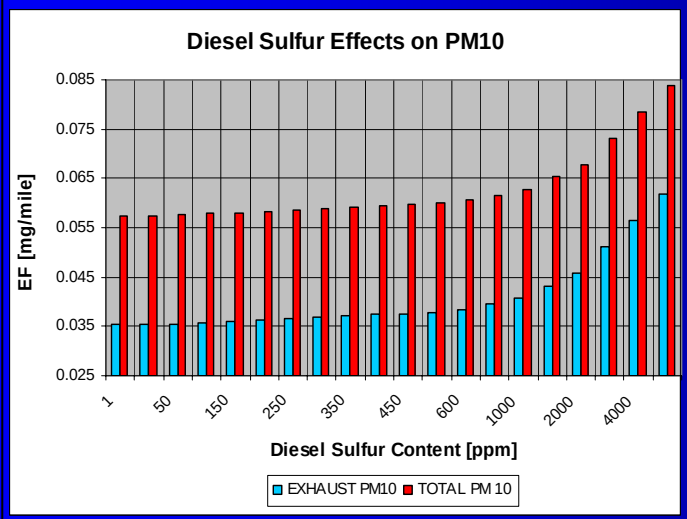


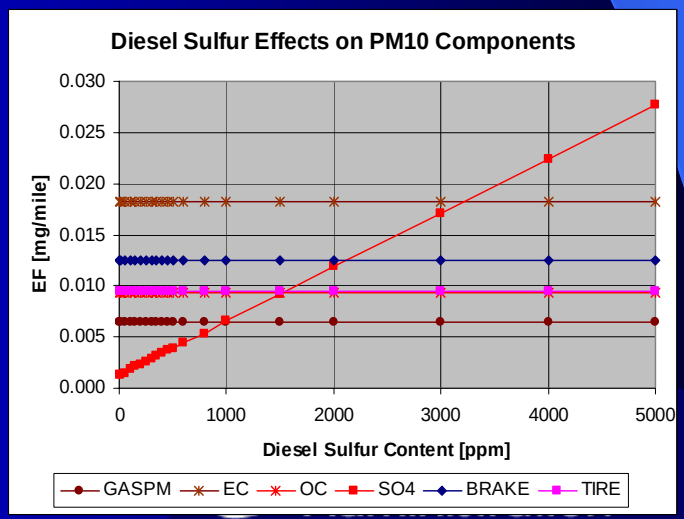


Diesel sulfur effects

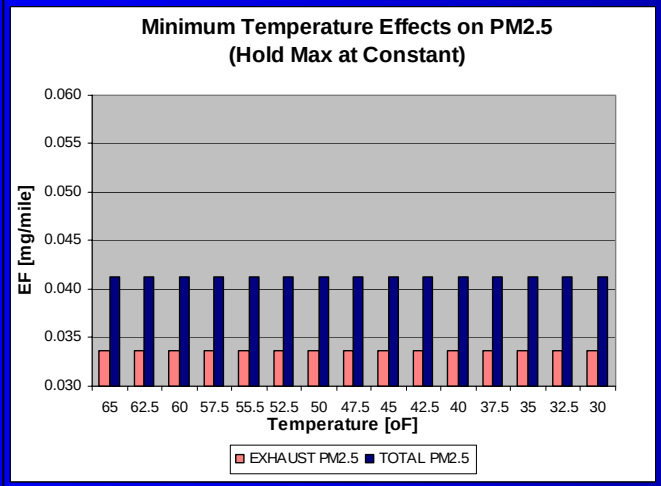


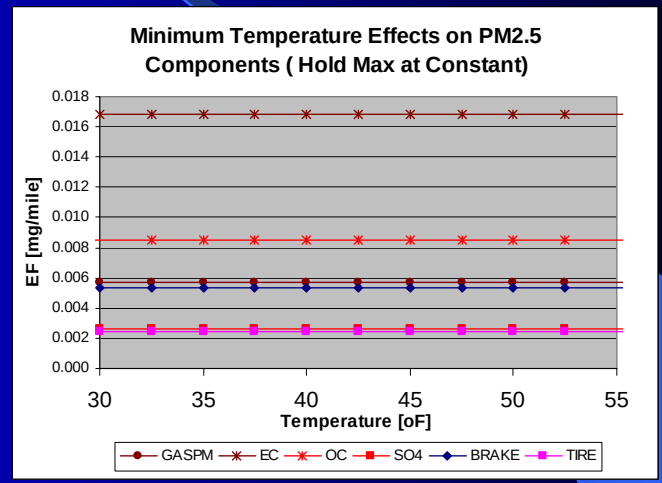


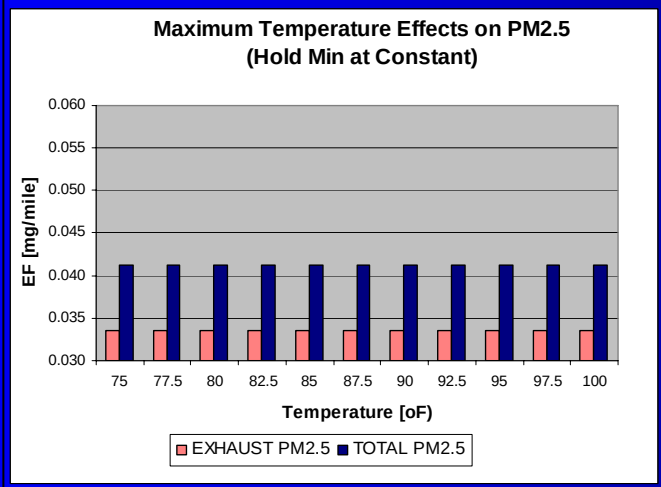


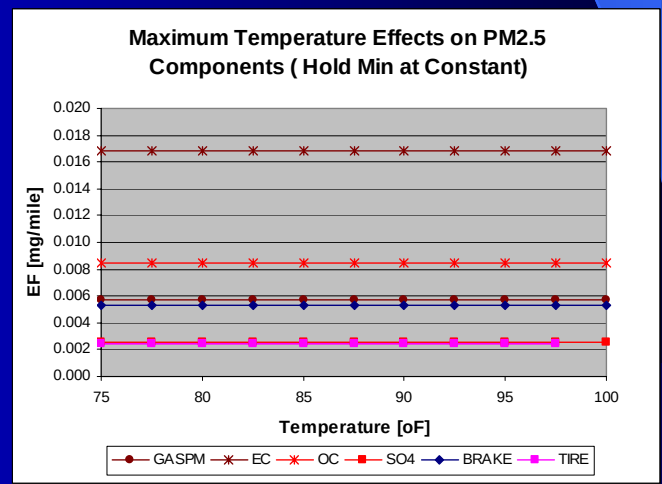


Minimum and Maximum Temperature Effects on PM 2.5

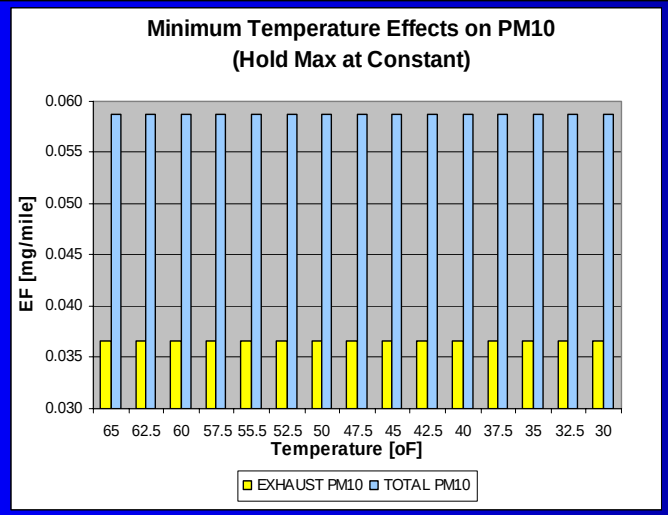


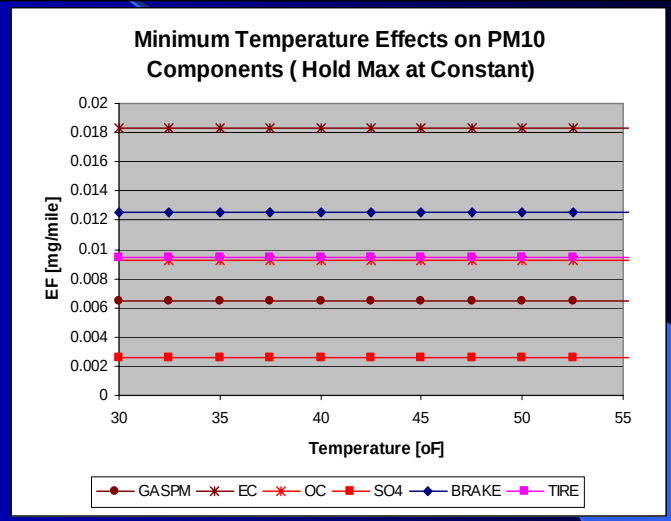


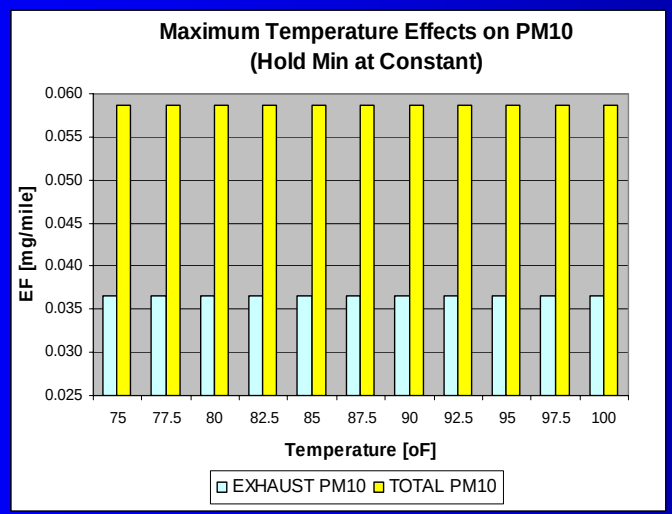


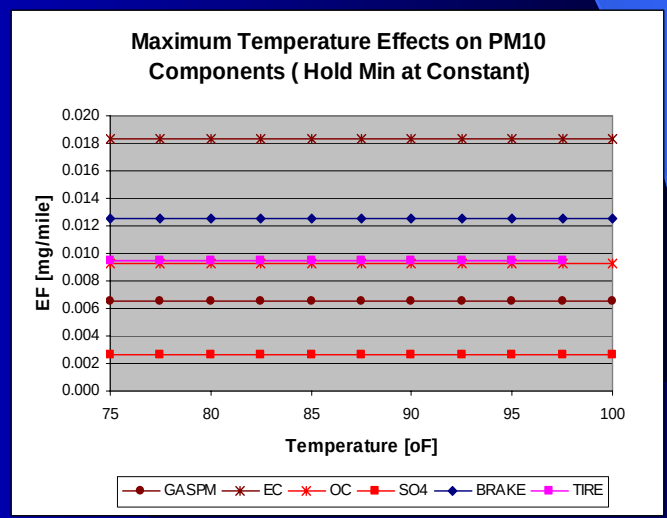


Minimum and Maximum Temperature Effects on PM10

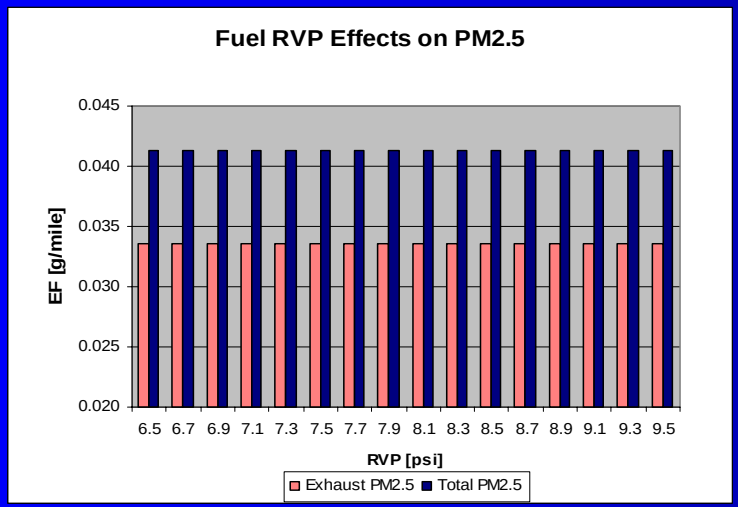


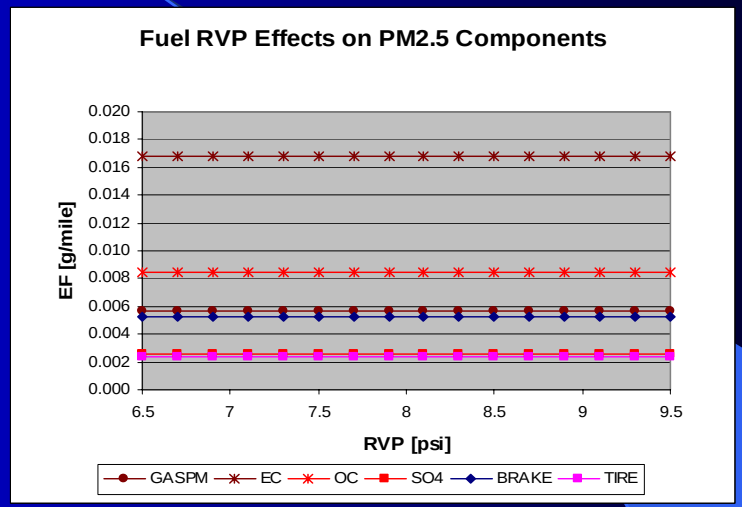


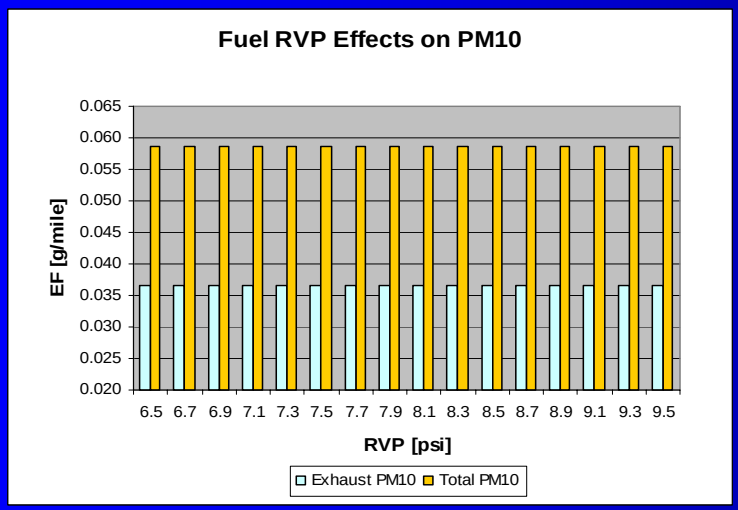


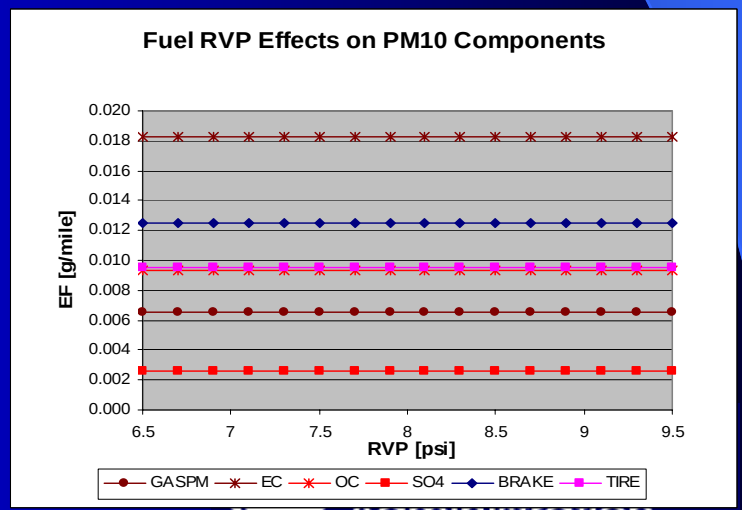


Fuel RVP Effects









Conclusions

- Exhaust emissions factors tend to be lower using M6.2 than predicted by PART5, while tire wear and brake wear emission factors tend to be higher.
- M6.2's PM emission factors benefit from:
  - the use of newer data (vehicle registration, diesel fractions, fuel economy, and mileage accumulation rates)
  - the inclusion of recent rulemaking (including fuel sulfur level reductions)
  - capability to account for the sulfur level of fuels (gasoline and diesel)

Conclusions

- The sensitivity analysis of the M6.2 PM module indicated that PM2.5 emission factors results are consistent with PM10 emission factors.
- It was found that emission factors tend to decrease for both PM2.5 and PM10 in later calendar years.
- The difference is apparently related to future model years updates reflecting more stringent vehicle emissions and fuel standards.

Conclusions

- Negligible Effects:
  - roadway facility types
  - Speed
  - Gasoline Sulfur
  - Minimum and maximum temperature
  - Fuel RVP

- Highly Sensible Effects
  - diesel sulfur content.

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Conclusions

- Remember that you still need to use the December 2003 AP42 Methods for re-entrained dust!

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