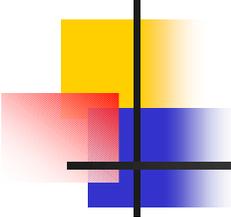


PUBLIC MEETING TO CONSIDER
REVISIONS TO THE STATE'S
ON- ROAD MOBILE SOURCE
EMISSIONS INVENTORY

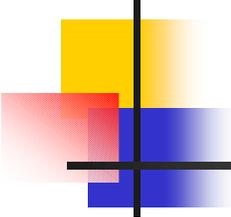
California Air Resources Board

May 25, 2000



Presentation Outline

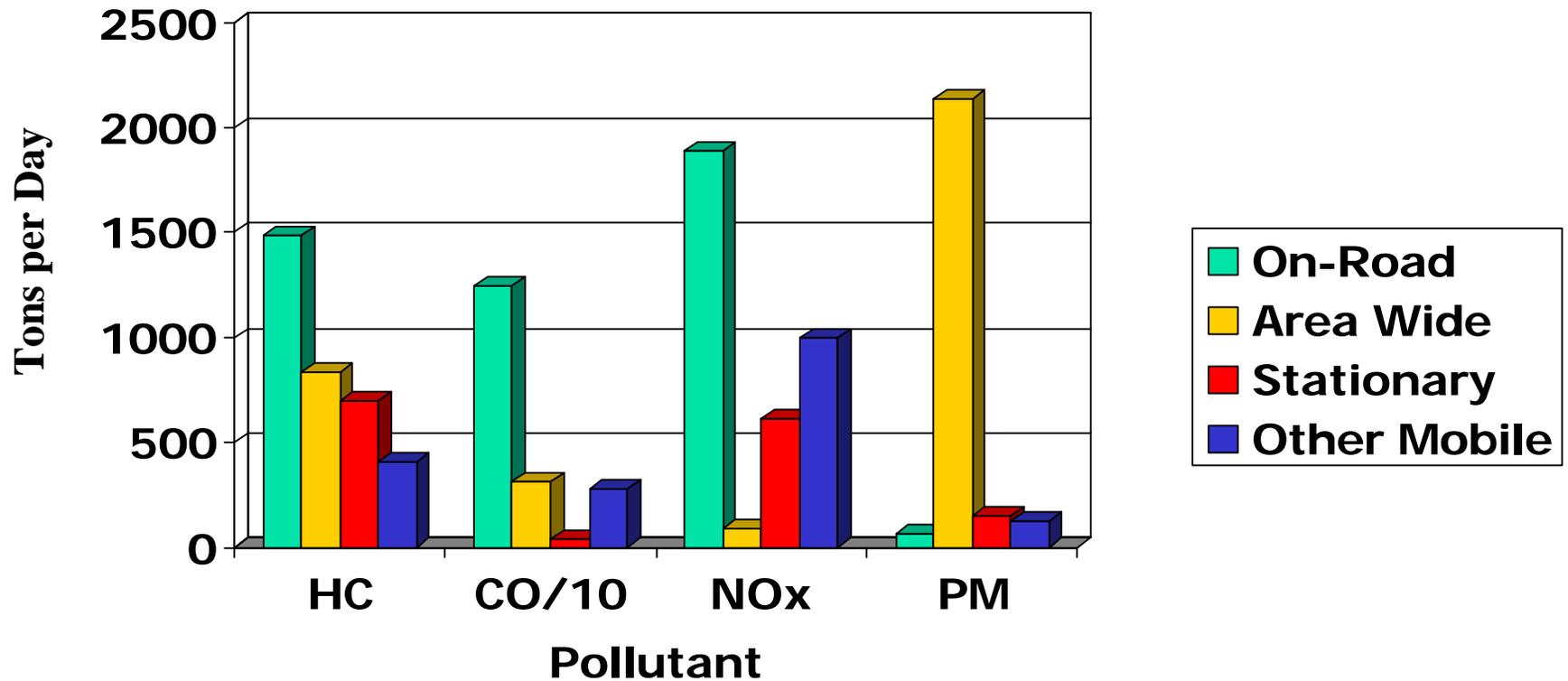
- Overview of Emissions Inventory
- Light-Duty Exhaust Emissions
- Light-Duty Evaporative Emissions
- Heavy-Duty Truck Emissions
- Newly Adopted Standards
- Comments
- Future Model Improvements

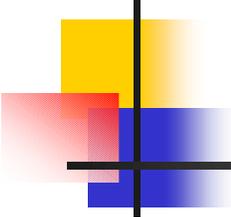


Emissions Inventory Overview

- On-Road Mobile Sources
- Off-Road Mobile Sources
- Stationary Sources
- Area-Wide Sources

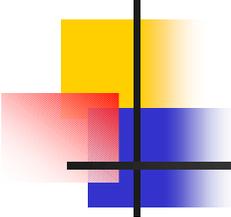
Emissions Inventory by Category Statewide - 2000





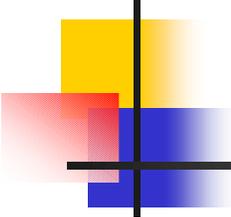
Uses of the Approved Inventory

- SIP Development
- Control Measure Development
- Transportation Plan (Conformity)
- Air Toxics Assessment
- Air Quality Models



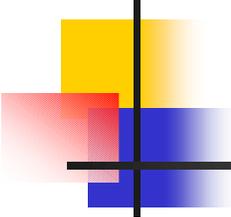
Need For Estimation Models

- Projecting Emission Trends
- Determining Effectiveness of Adopted or Proposed Measures Requires EMFAC
- Specific to California



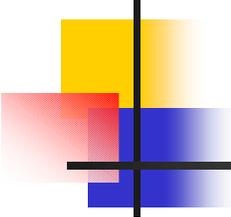
Emissions Inventory Development

- Emission Factor
 - (gm/mi or gm/hr or gm/start)
- Activity
 - (starts/miles/speed/soaks)
- Vehicle Population
 - (by class/fuel/age/technology)
- Inventory
 - HC/CO/NO_x/PM/Pb/SO_x/CO₂



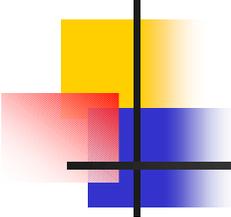
Modeling History

- EMFAC7D January 1988
- EMFAC7E July 1990
- EMFAC7EP December 1990
- EMFAC7F September 1993
- MVEI7G October 1996



Development of Current Inventory

- Workshops Held in Both El Monte and Sacramento
- Comments Received During December 1999 Workshop Prompted Further Revision
- Current Inventory Lower for All Pollutants Compared to December

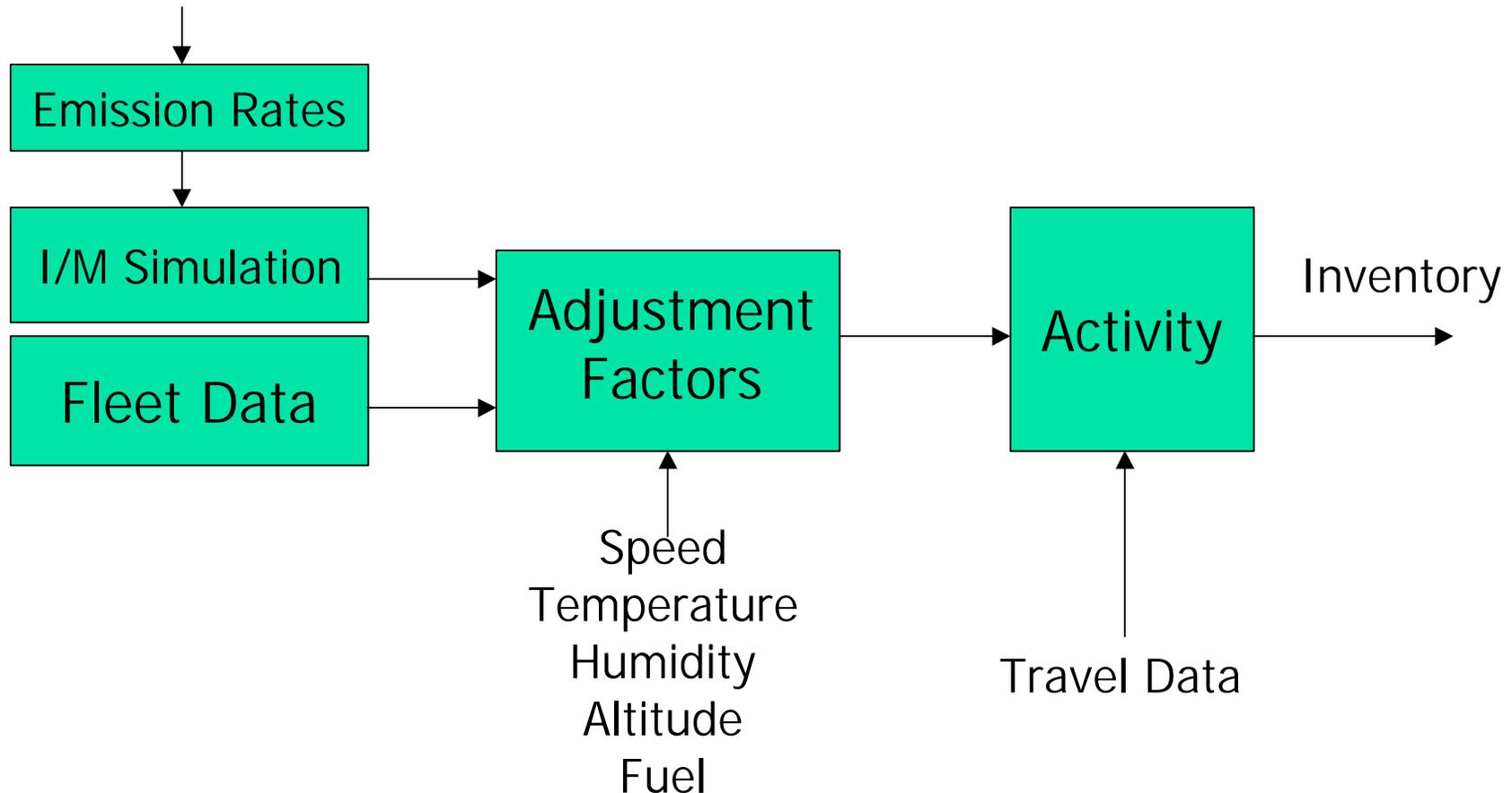


New Data in EMFAC2000

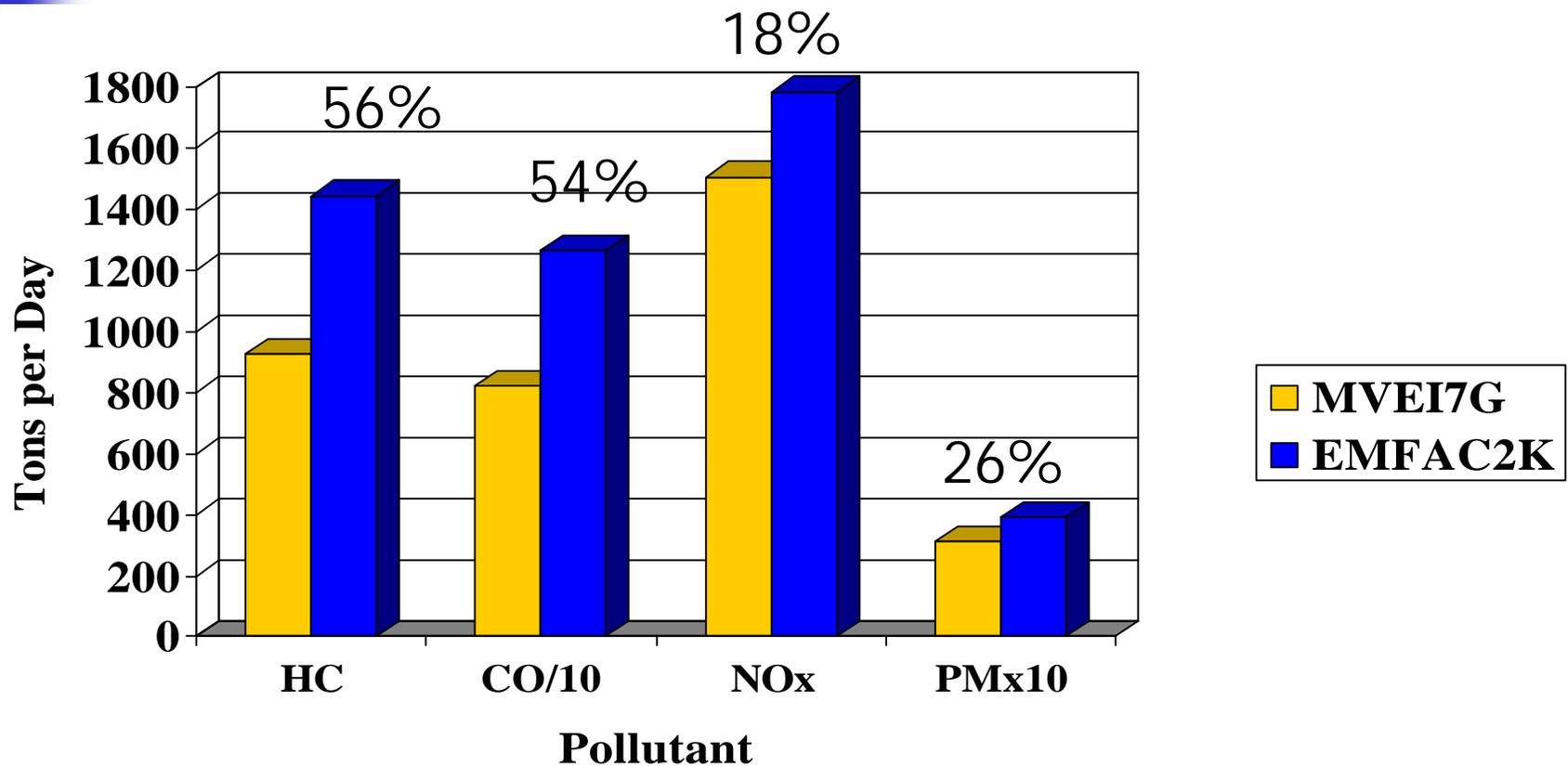
- 3,000 Light-Duty Vehicles Tested for Basic Emission Rates
- 1,000 Vehicles Tested on Contemporary Driving Cycle
- 140 Vehicles Tested to Characterize Speed Effects
- 1,000 Vehicles Tested for Evaporative Emissions
- 50 Heavy-Duty Trucks Tested on Chassis Dynamometer

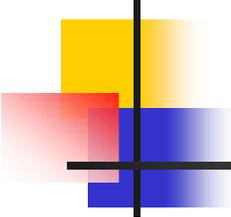
Block Diagram of EMFAC2000

Emissions Test Data



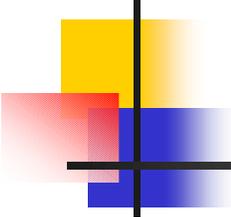
Proposed Emissions Inventory Statewide - 2000





Major Changes

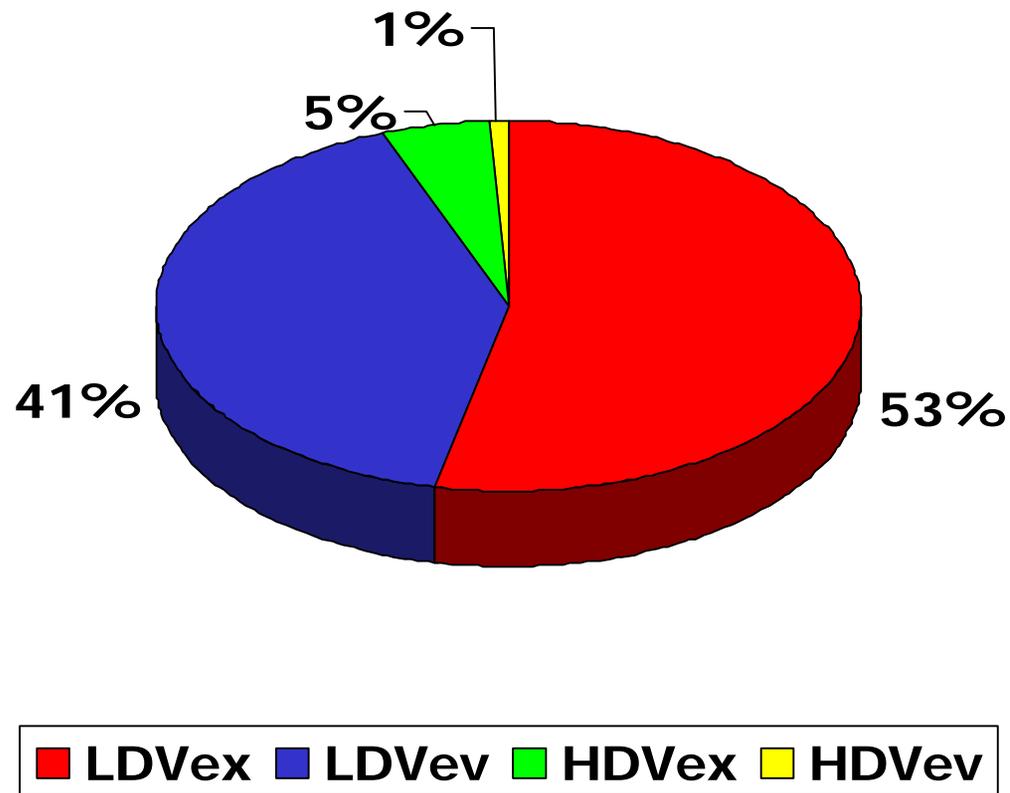
- Reflects Recently Adopted Regulations
- Revised Basic Emission Rates
- Used More Representative Driving Cycles
- New Speed Adjustment Cycles
- Addition of Liquid Leakers
- Chassis Test Data for HDVs
- Addition of Off-Cycle NO_x for HDVs
- Includes Unregistered Vehicles



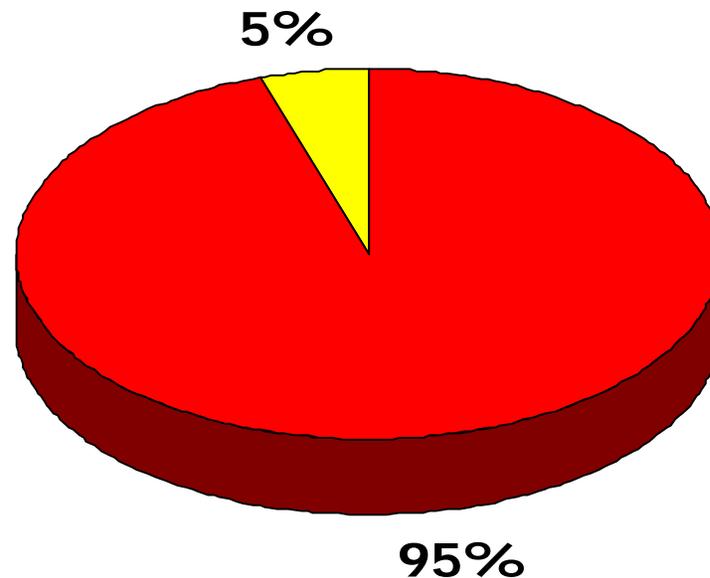
Other Changes

- Heavy Duty Idle Emissions
- Heavy Duty PM Emissions
- County Specific Activity Estimates
- Hourly Activity Data
- Correction for Relative Humidity
- Air Conditioning Effects Updated
- Expanded Vehicles Classes and Technology Groups

Relative Contribution to Inventory (Hydrocarbon – SCAB 2000)

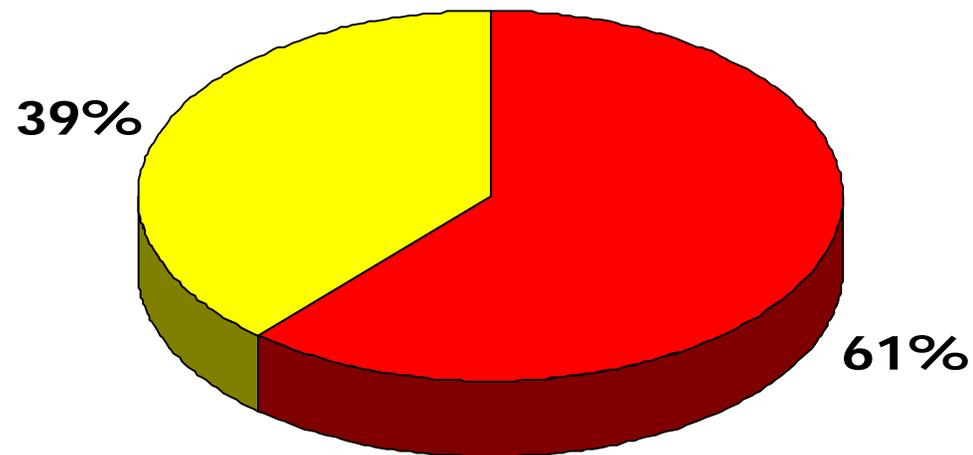


Relative Contribution to Inventory (Carbon Monoxide – SCAB 2000)



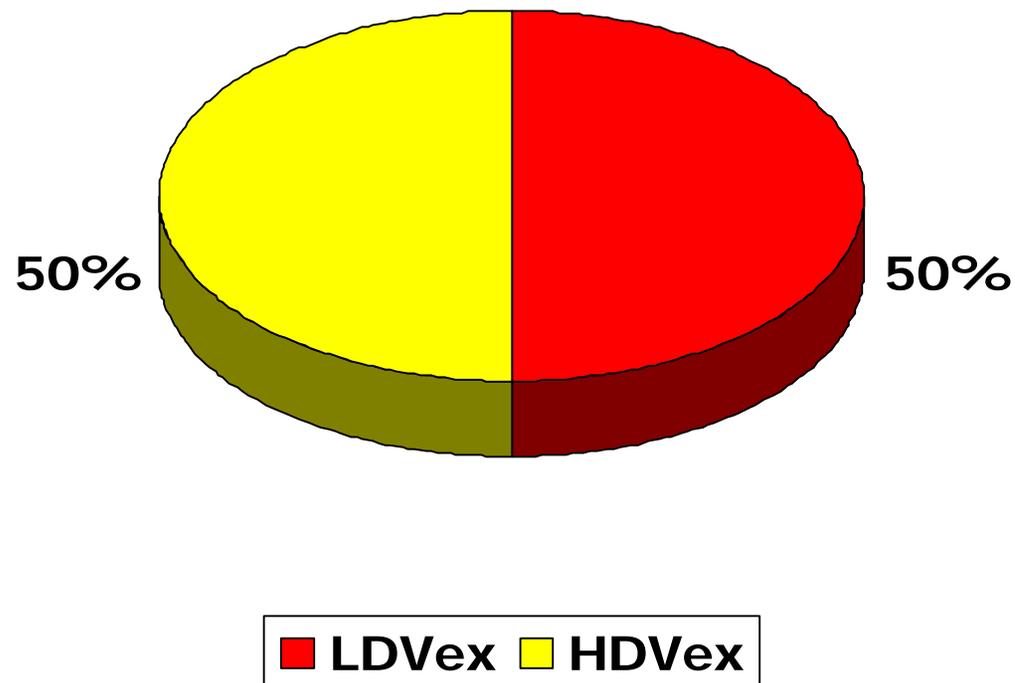
■ LDVex ■ HDVex

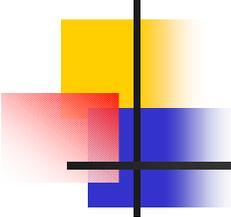
Relative Contribution to Inventory (Oxides of Nitrogen – SCAB 2000)



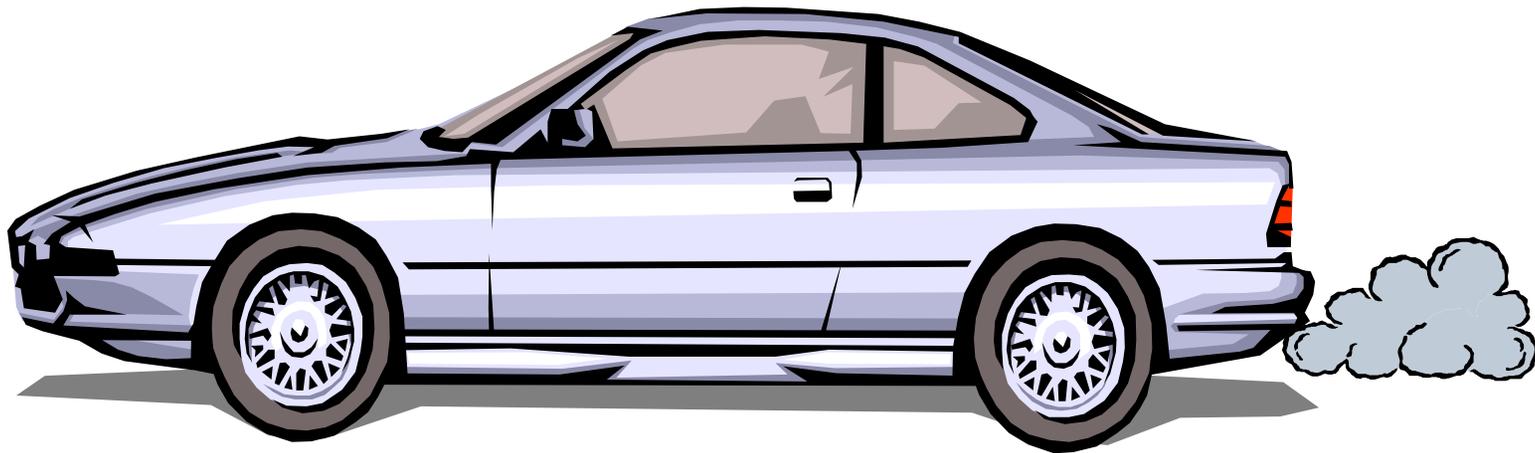
■ LDVex ■ HDVex

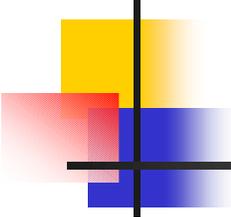
Relative Contribution to Inventory (Particulate Matter – SCAB 2000)





Light-Duty Exhaust Emissions



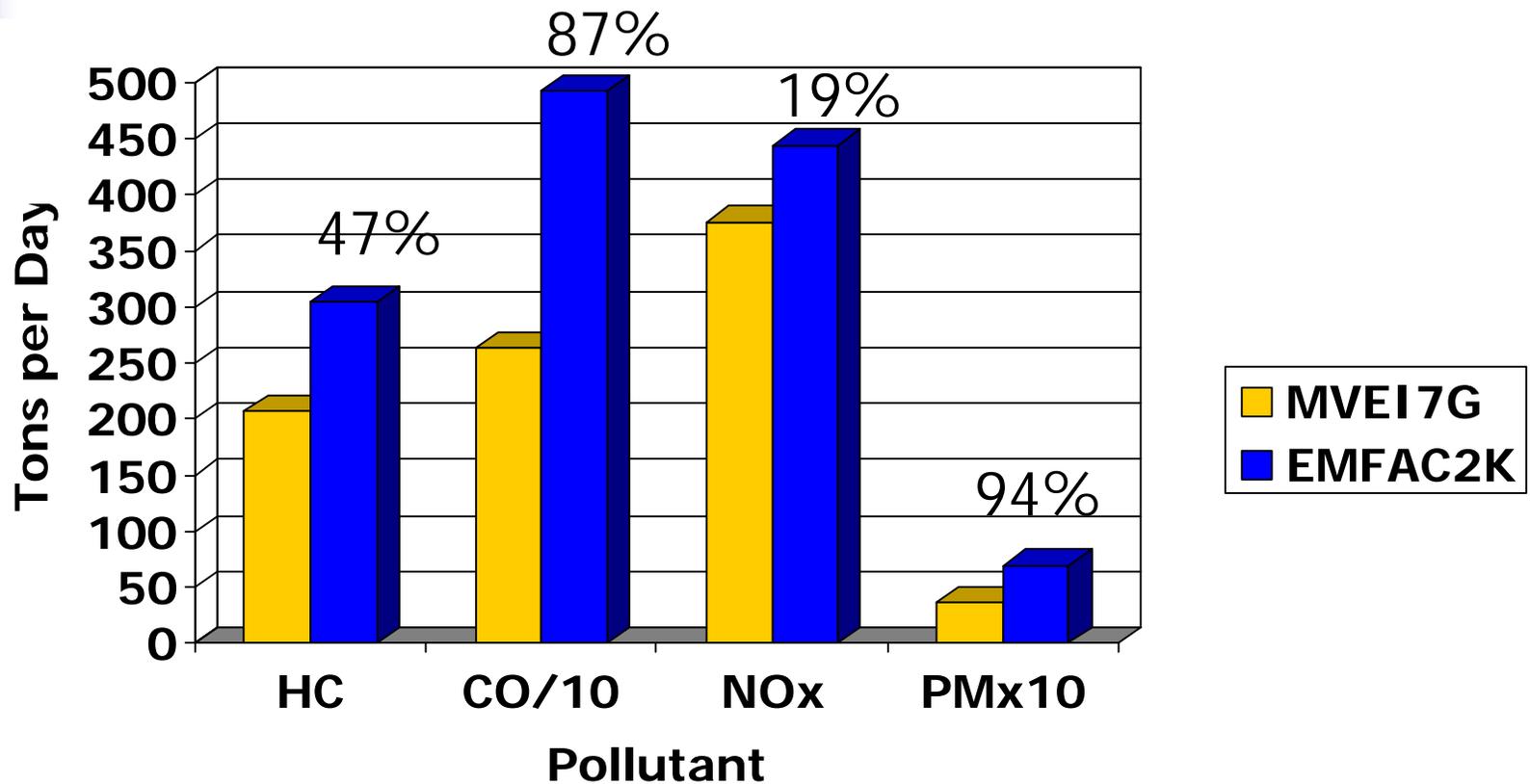


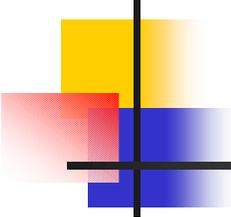
Exhaust Emission Testing (Light Duty Vehicles)

- Tests Performed on Dynamometer
- Federal Test Procedure (FTP)
- Unified Cycle (LA92)
- Smog Check Cycles
 - Acceleration Simulation Mode (ASM)
 - IM240
- Speed Adjustment Cycles

Emissions Inventory Comparison

(Light Duty Exhaust Emissions – SCAB 2000)

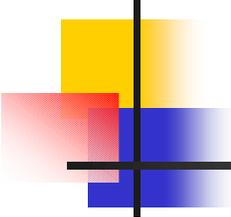




Reasons for Inventory Increase

Light-Duty Vehicle Exhaust Emissions

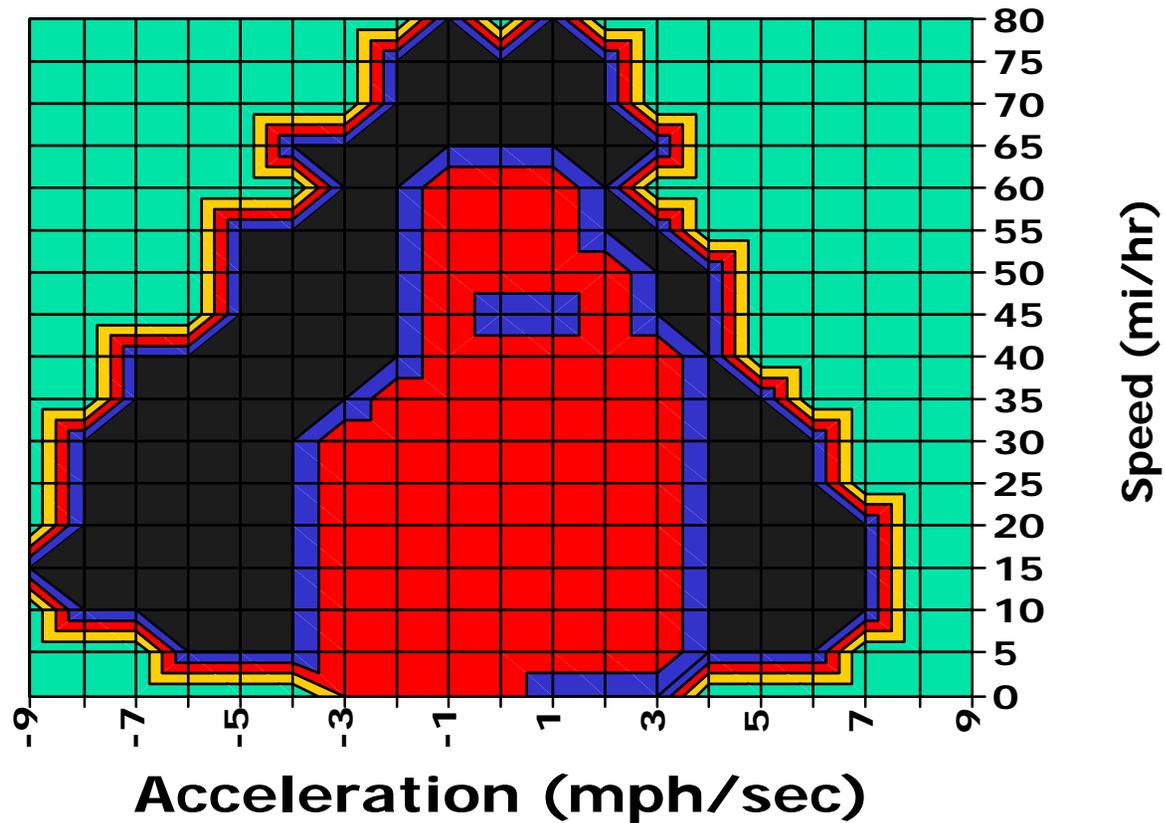
- Exhaust Emission Rates
- Driving Cycle Adjustments
- Speed Adjustment Factors



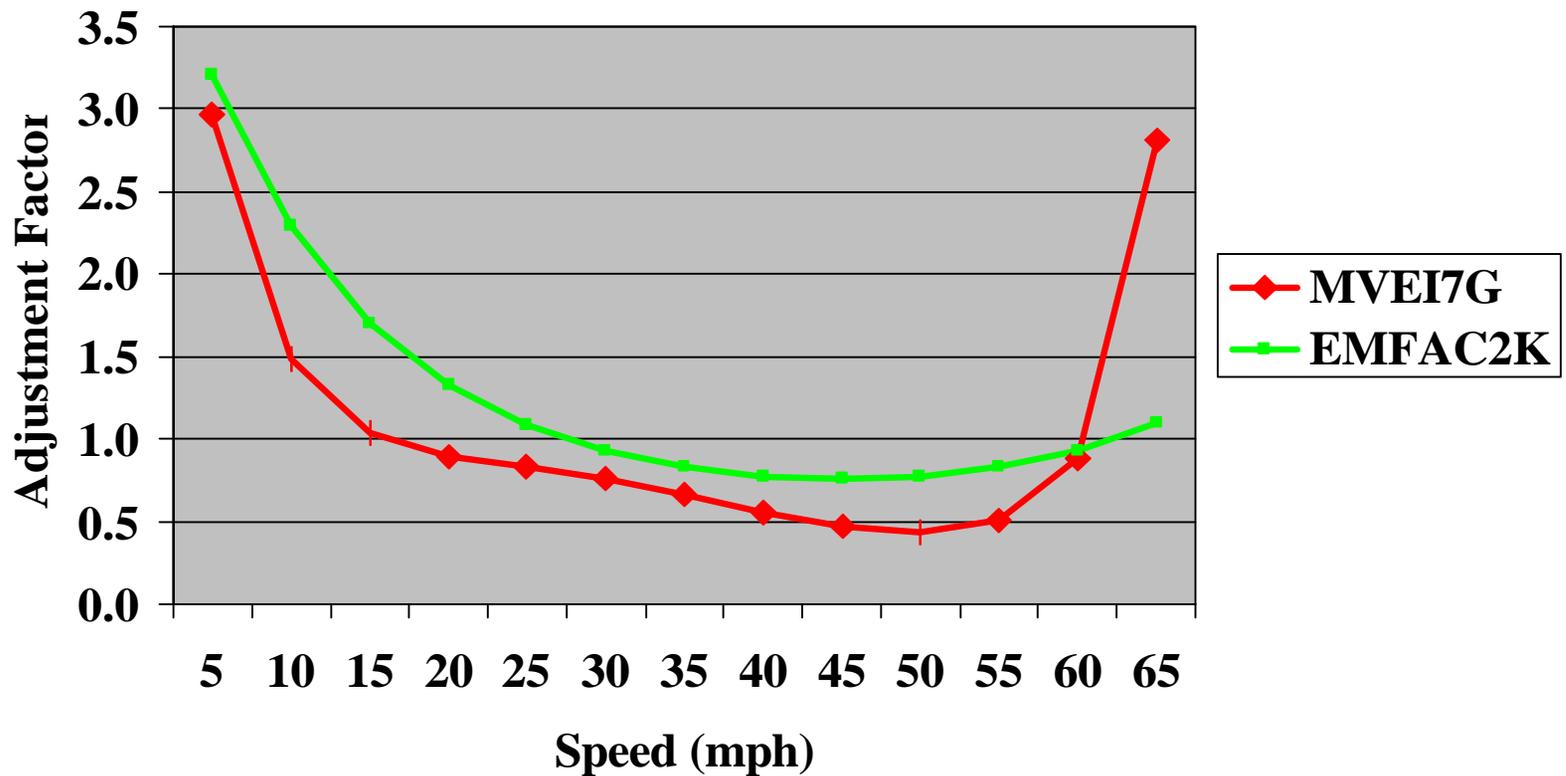
Exhaust Emission Rates

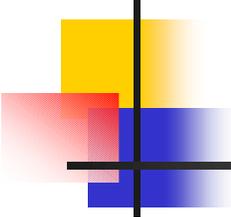
- Addition of New Data
- Higher Emission Rates
- Changes in Deterioration Rates

Drive Cycle Comparison

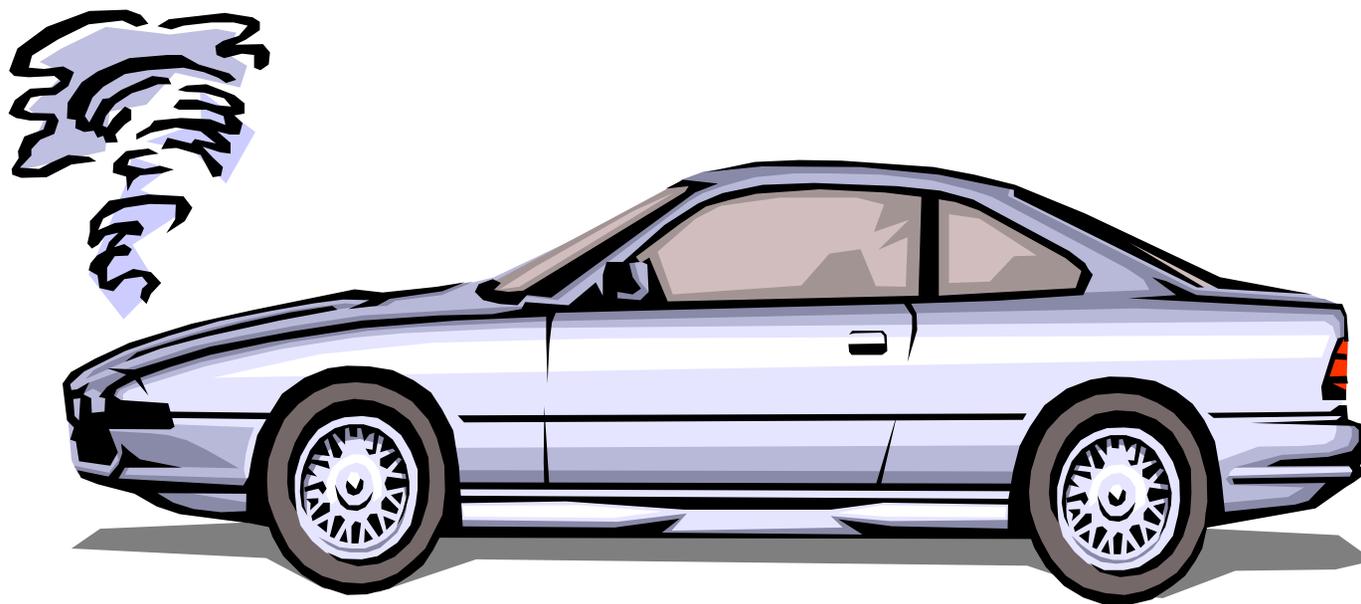


Revised Speed Adjustment Factors (Hydrocarbon)

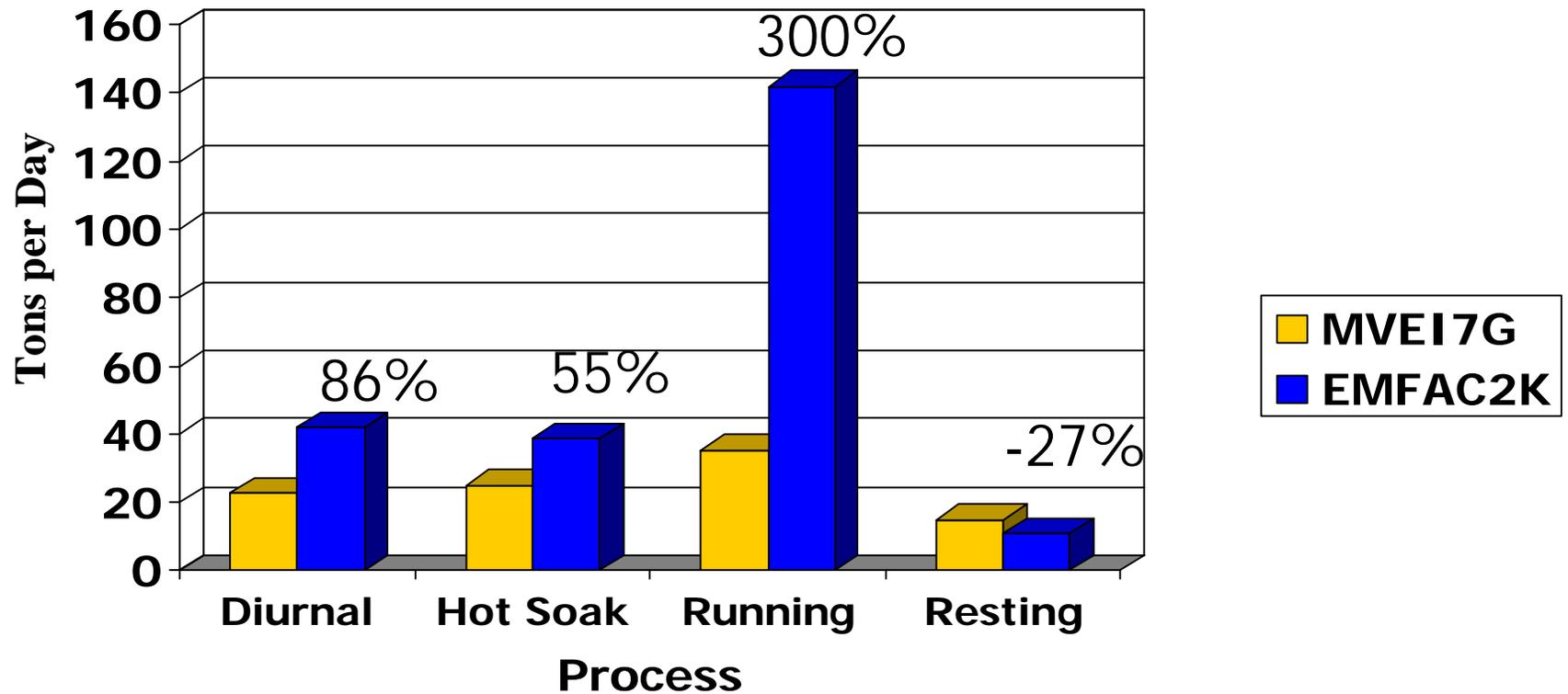


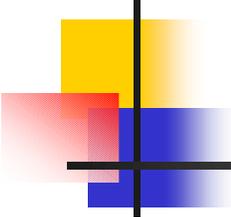


Light Duty Evaporative Emissions



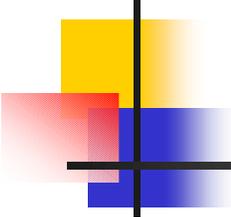
Emissions Inventory Comparison (Evaporative HC – SCAB 2000)





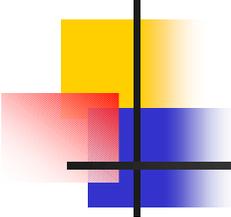
Reasons for Inventory Increase

- Liquid Leakers
- Running Losses



Evaporative Emissions Testing

- Tests Performed in an Air Tight Enclosure
 - Diurnal
 - Evaporation Due to Ambient Temperature
 - Hot Soak
 - Evaporation Due to Fuel Circulation
 - Resting Loss
 - Evaporation Due to Permeation
 - Running Losses
 - Evaporative Losses While Vehicle is Running
 - Performed on a Dynamometer in an Air Tight Enclosure



Evaporative Emissions Testing

Running Loss

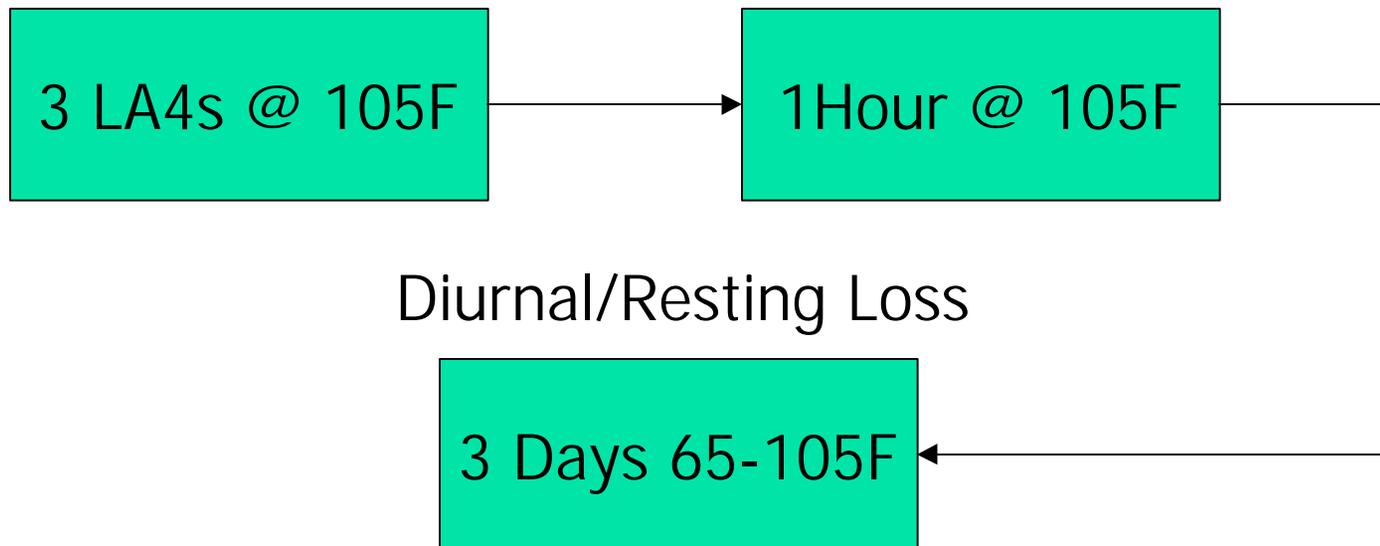
3 LA4s @ 105F

Hot Soak

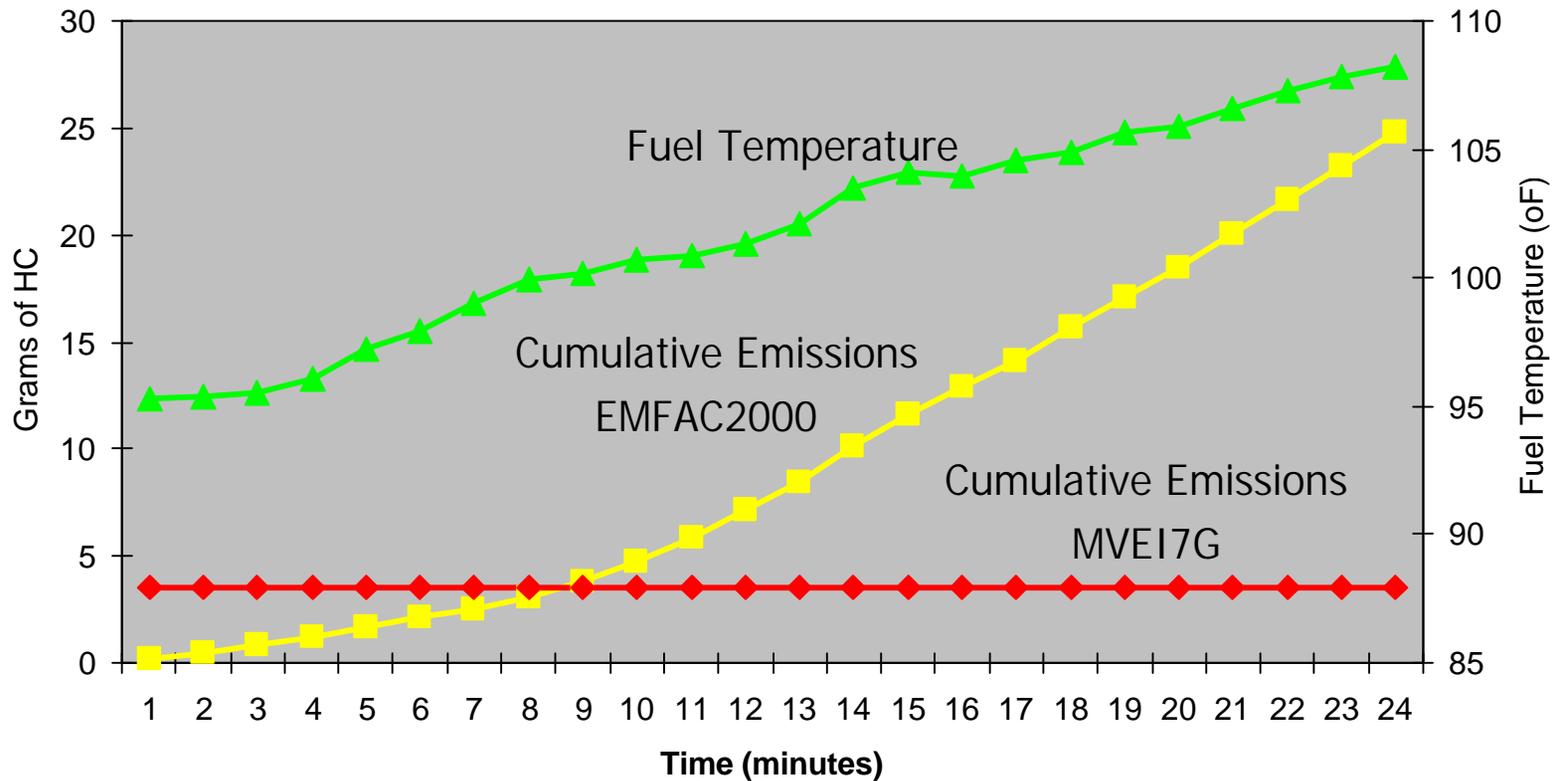
1 Hour @ 105F

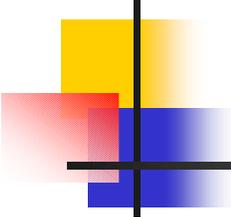
Diurnal/Resting Loss

3 Days 65-105F



Example of Running Loss Emissions (1978 Olds 6.6 Carbureted)



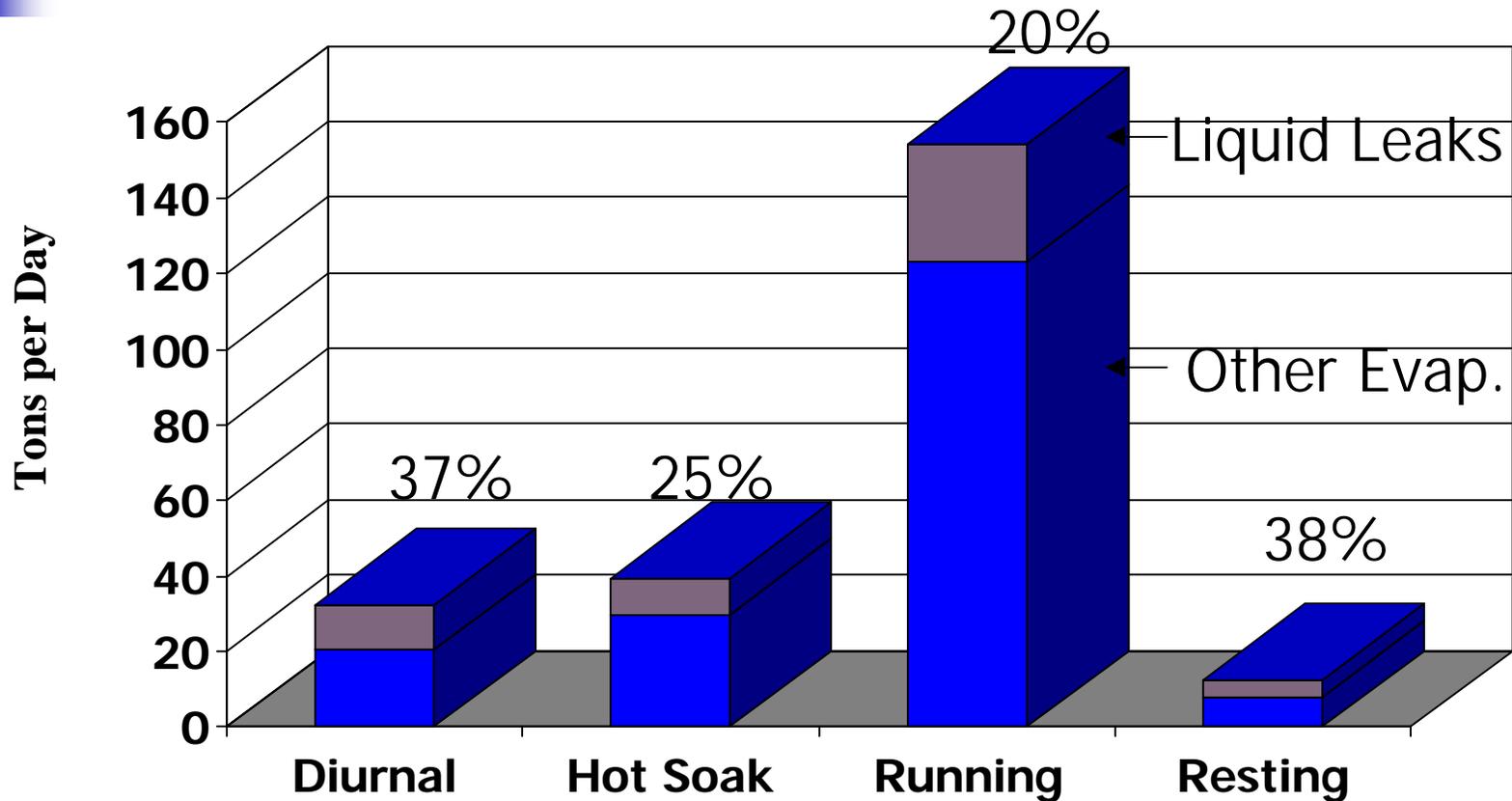


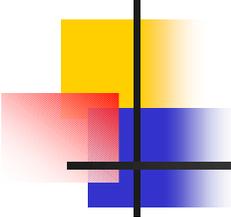
Emissions of Liquid Leakers

- Vehicles Which Drip Fuel From Fittings, Hoses, Fuel Injectors, etc.,
- Up To 5 Percent Of Vehicle Population Has Liquid Leaks.
- Emissions Can Be As High As 40 grams per mile.

Contribution of Liquid Leakers

(South Coast Air Basin – 2000)

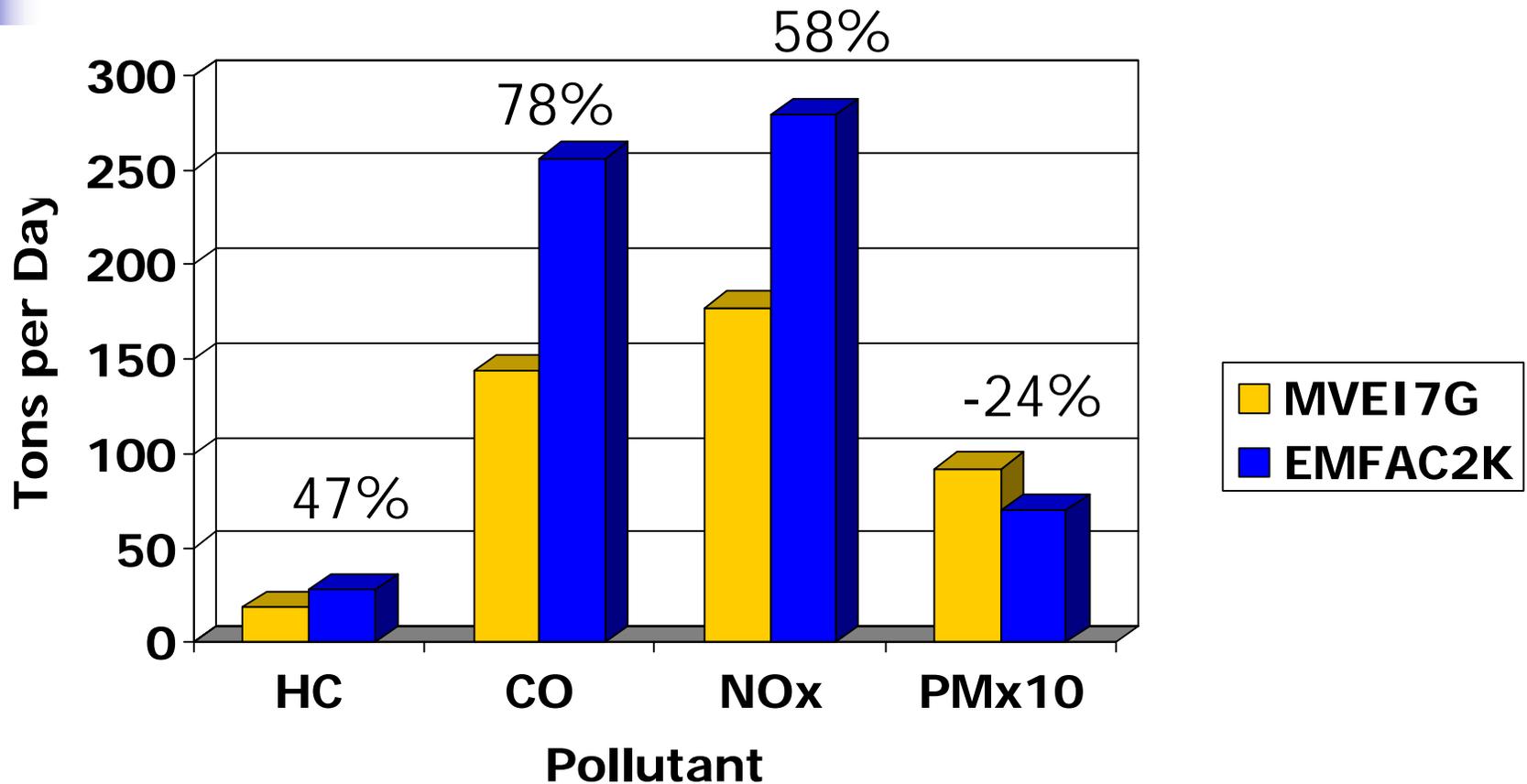


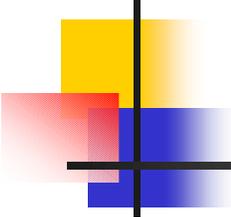


Heavy-Duty Truck Emissions



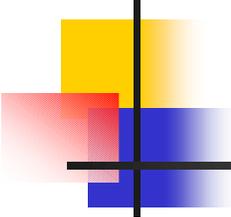
Emissions Inventory Comparison (Heavy-Duty Vehicles-SCAB 2000)





Reasons for Changes in the Inventory

- Used Chassis Instead of Engine Test Data
 - Increases NO_x Emissions
 - Decreases PM Emissions
- Included Off-Cycle Operating Conditions
 - Increases NO_x Emissions
 - Decreases PM Emissions

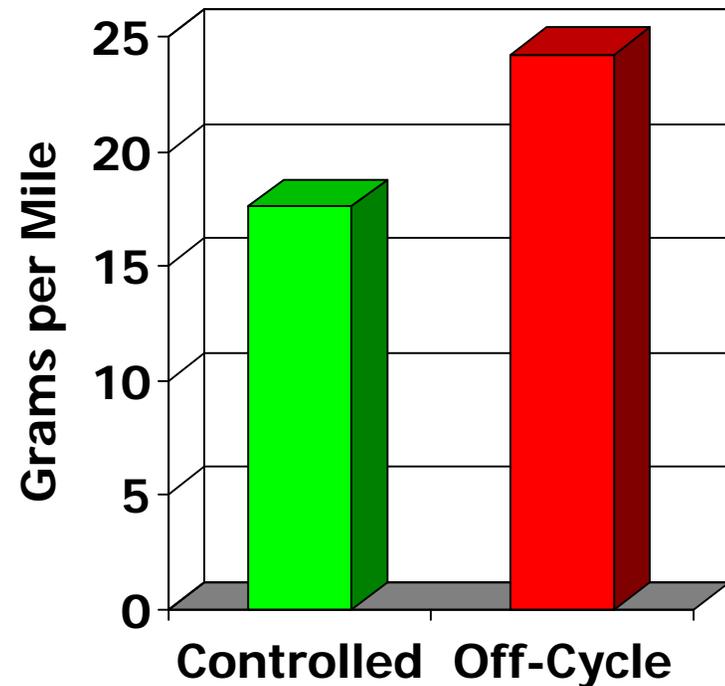


EMFAC2000 Heavy-Duty Emissions

- Directly Measured Grams per Mile Based on Three Distinct Test Cycles
 - Heavy-Duty Chassis Cycle (18 Wheelers)
 - Light-Duty Cycles (Urban Trucks)
 - Central Business District Cycle (Buses)
- Tested More Trucks and Buses

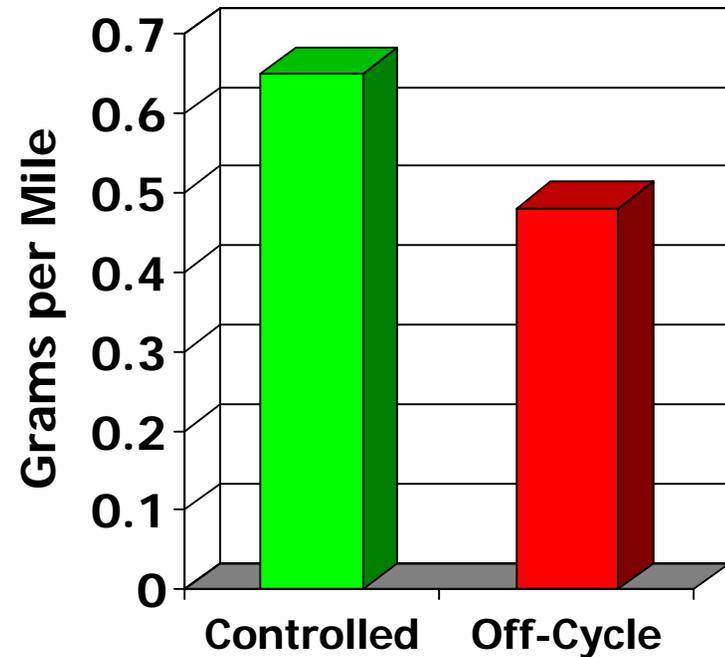
Off-Cycle NOx Emissions

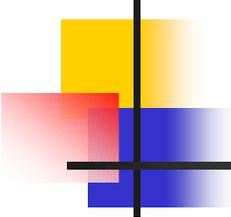
- Higher Emissions Outside of Compliance Test
- Affects 1988 to 1998 Heavy-Duty Engines
- Consent Decree Ended This Practice



Off-Cycle PM Emissions

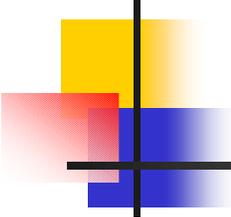
- Inverse Relationship Between NOx and PM
- Fuel Saving Strategy Reduced PM Corresponding to NOx Increases





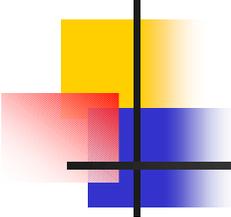
ACTIVITY





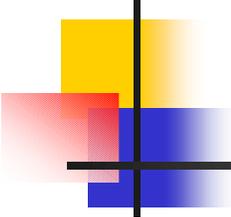
What is Activity

- Vehicle Population
- Vehicle Age Distribution
- Vehicle Miles of Travel (VMT)
- Starts per Vehicle per Day
- VMT by Speed
- Mileage Accrual Rates
- Soak Distributions (Inactivity)



Sources of Activity Information

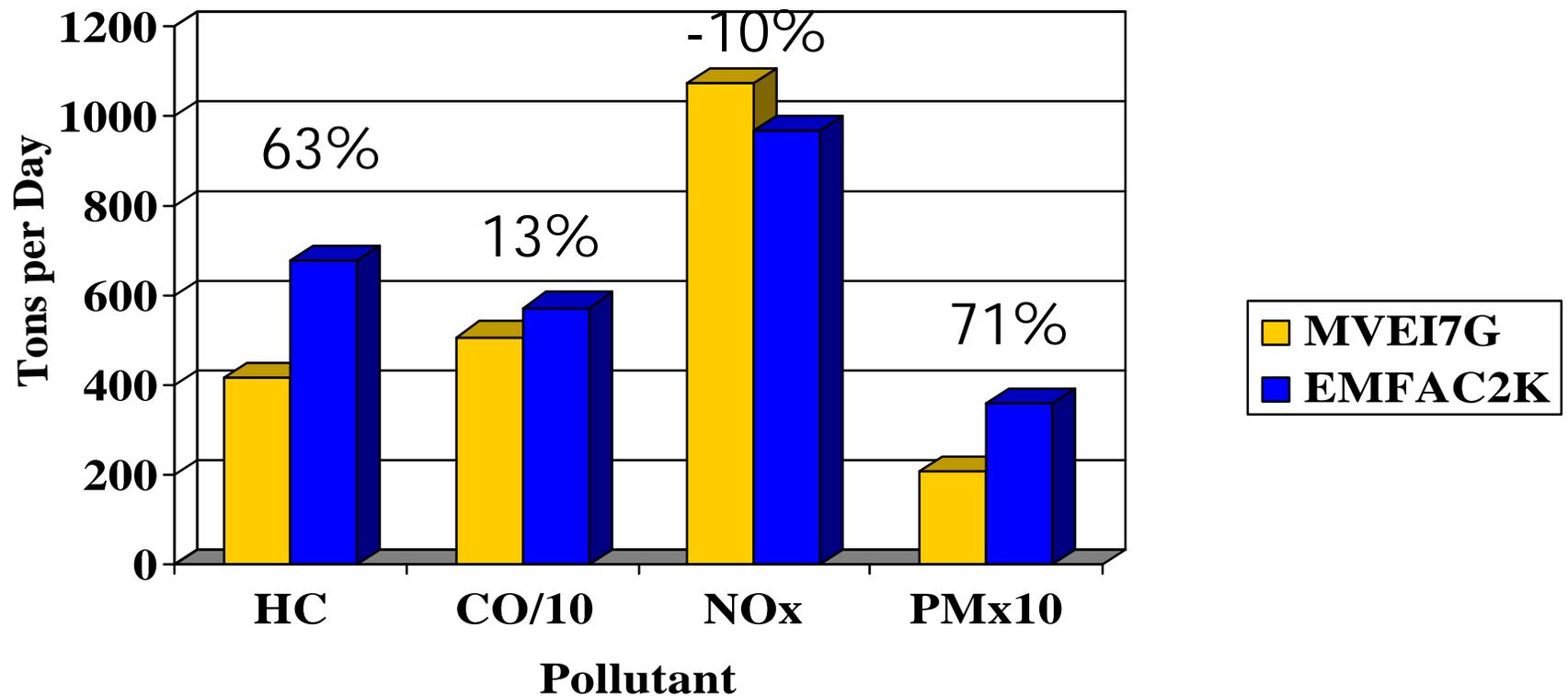
- Vehicle Miles of Travel
 - Large Urban Areas – COGs and MPOs
 - Other Areas - Calculated by EMFAC2000
- Vehicle Population – DMV
 - Age Distribution
 - Unregistered Vehicles
- Annual Mileage – BAR
- Starts per Vehicle per Day – ARB / Caltrans
 - Instrumented Vehicle Studies / Travel Surveys

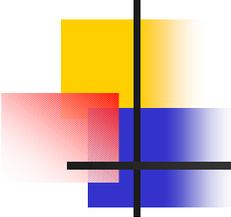


NEWLY ADOPTED REGULATIONS

- Low Emissions Vehicle II
- Near Zero Evaporative Emissions
- New On-Road Motor Cycle Standards
- Off-Cycle NO_x Mitigation
- New Transit Bus Emissions Standards
- LDV Off-Cycle Emissions
- 2.0 Gram Heavy-Duty NO_x
- RFG3 (To Be Included)

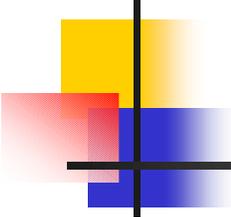
Proposed Emissions Inventory Statewide - 2010





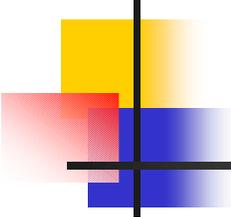
Comments

- Toyota
 - ZEV Implementation
 - ODB Response Rate
 - Evaporative Emissions
- Bay Area AQMD
 - Default I/M Assumptions and VMT
- CALTRANS



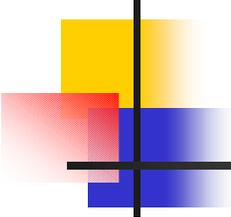
SIP and Conformity

- ARB Will Not Submit EMFAC2000 to U.S. EPA Until Conformity Issues Addressed.
- No Change In Approach For Microscale CO Analyses.



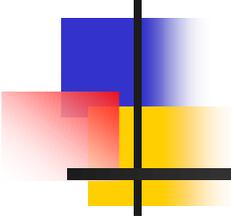
National Academy of Sciences (Comments on MOBILE)

- Improve Model Flexibility
- Chassis Tests for Heavy-Duty Vehicles
- Response to “Check Engine” Light
- Long Term Planning/Improved Coordination
- Incorporate Toxics Emissions
- Use Advances in Technologies (GIS)
- Model Validation/Sensitivity Analysis
- Characterization of High Emitters



Future Model Improvements

- Incorporation of New Data
 - Evaluation of Smog Check
 - Expanded Heavy-Duty Truck Testing
- Emissions Estimates for Specific Road Types
- Analysis of On-Board Diagnostics
- Accommodate Alternative Inputs
- Technical Advisory Committee
- Incorporation of Toxics
- Better Spatial Resolution With Grade (GIS)



Recommendation

Approve Emissions Inventory with
Staff's Recommended Changes