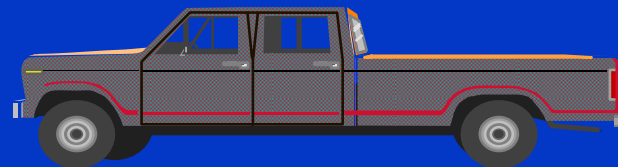
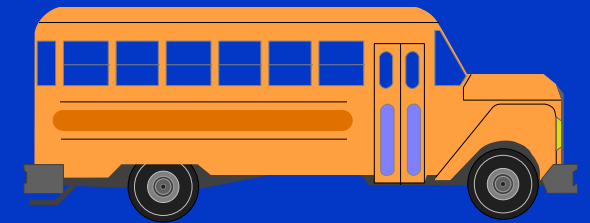
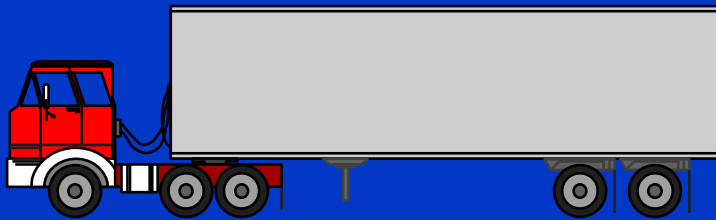


# *Heavy Duty Vehicle*

## *Inspection*

### *Program*



# *Heavy Duty Vehicle Inspection Program*

- ◆ Established by SB 1997 in 1988
- ◆ Amended by AB 584 of 1993
- ◆ Health and Safety Code 44011.6

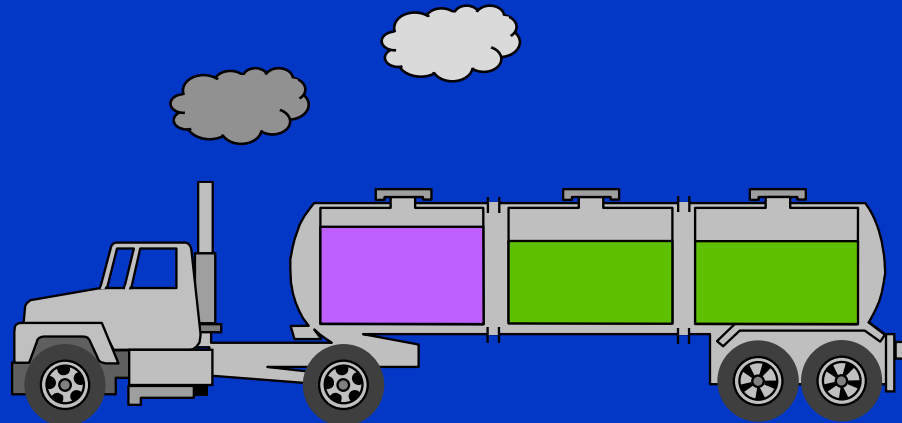
# *HDVIP Purpose*

- ◆ To Improve Air Quality
- ◆ Reduce Public's Exposure to Toxic Emissions
- ◆ Address Public Concern over Smoking Trucks and Buses



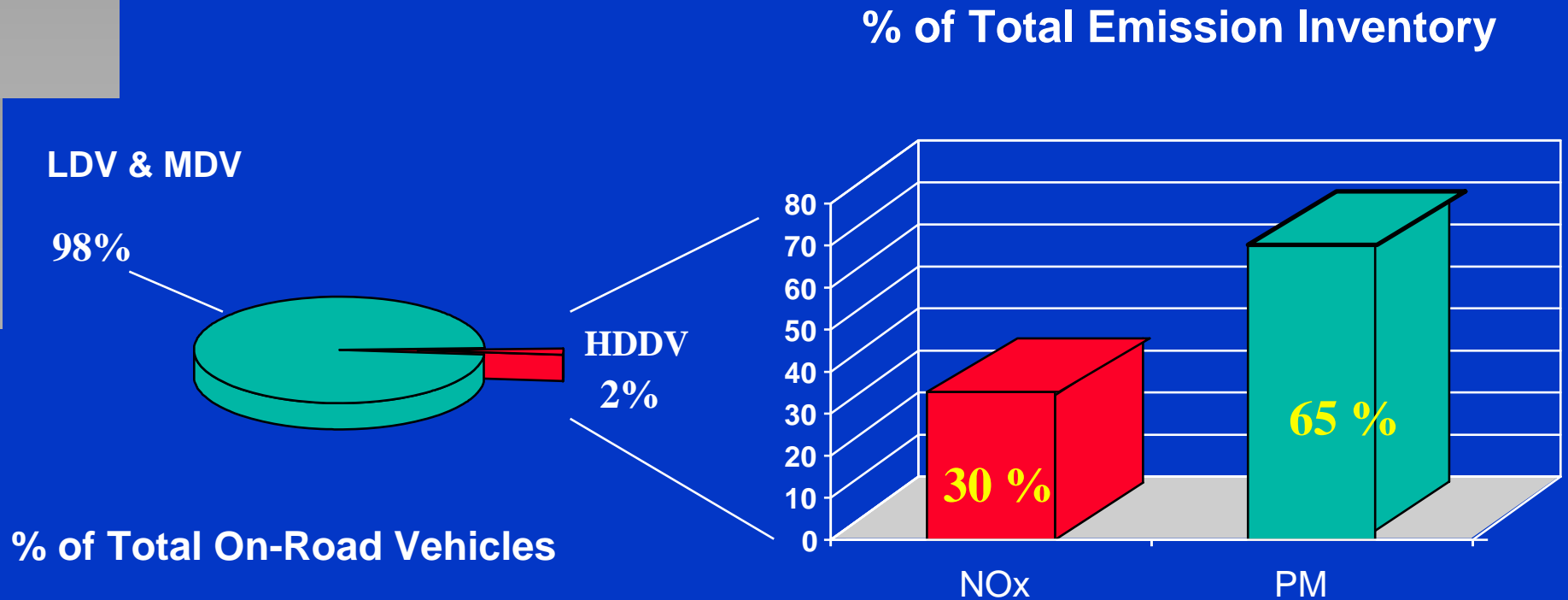
# *HDVIP Goal*

- ◆ To Reduce Excessive Smoke Emissions and Tampering on Gasoline and Diesel Powered Vehicles above 6000 Pounds G.V.W.R.



# Heavy-Duty Diesel Emissions

*(NO<sub>x</sub> & PM)*



# *Health and Safety Code*

## *Section 44011.6*

*(Established by SB 1997 of 1988)*

*(Amended by AB 584 of 1993)*

*(Amended by ARB 1460 of 1996)*

### ***Mandated Requirements***

- ◆ Set up Ad Hoc Advisory Committee  
(Industry-Government)
- ◆ Develop Test Procedures to Detect Excessive  
Smoke Emissions Which Produce  
Consistent and Repeatable Results  
(fulfilled by adoption of SAE J1667  
as required by AB 584)

# *Health and Safety Code*

## *Section 44011.6*

*(Established by SB 1997 of 1988)*

*(Amended by AB 584 of 1993)*

*(Amended by AB 1460 of 1996)*

### ***Mandated Requirements***

- ◆ Established Procedures to Remedy “False Failures”
- ◆ Develop Inspection Procedures for Emission Controls to Detect Tampering
- ◆ Develop Opacity Standards and Penalty Structure

# *Ad Hoc Advisory Committee*

- ◆ Air Resources Board (ARB)
- ◆ California Highway Patrol (CHP)
- ◆ California Trucking Association (CTA)
- ◆ Engine Manufacturers Association (EMA)
- ◆ South Coast Air Quality Management District (SCAQMD)





# *Ad Hoc Advisory Committee*

## *(Continued)*

- ◆ Diesel Fuel Refineries
- ◆ California Bus Association
- ◆ California Energy Commission (CEC)
- ◆ Heavy Duty Diesel Service Industry
- ◆ Highway Carriers Association



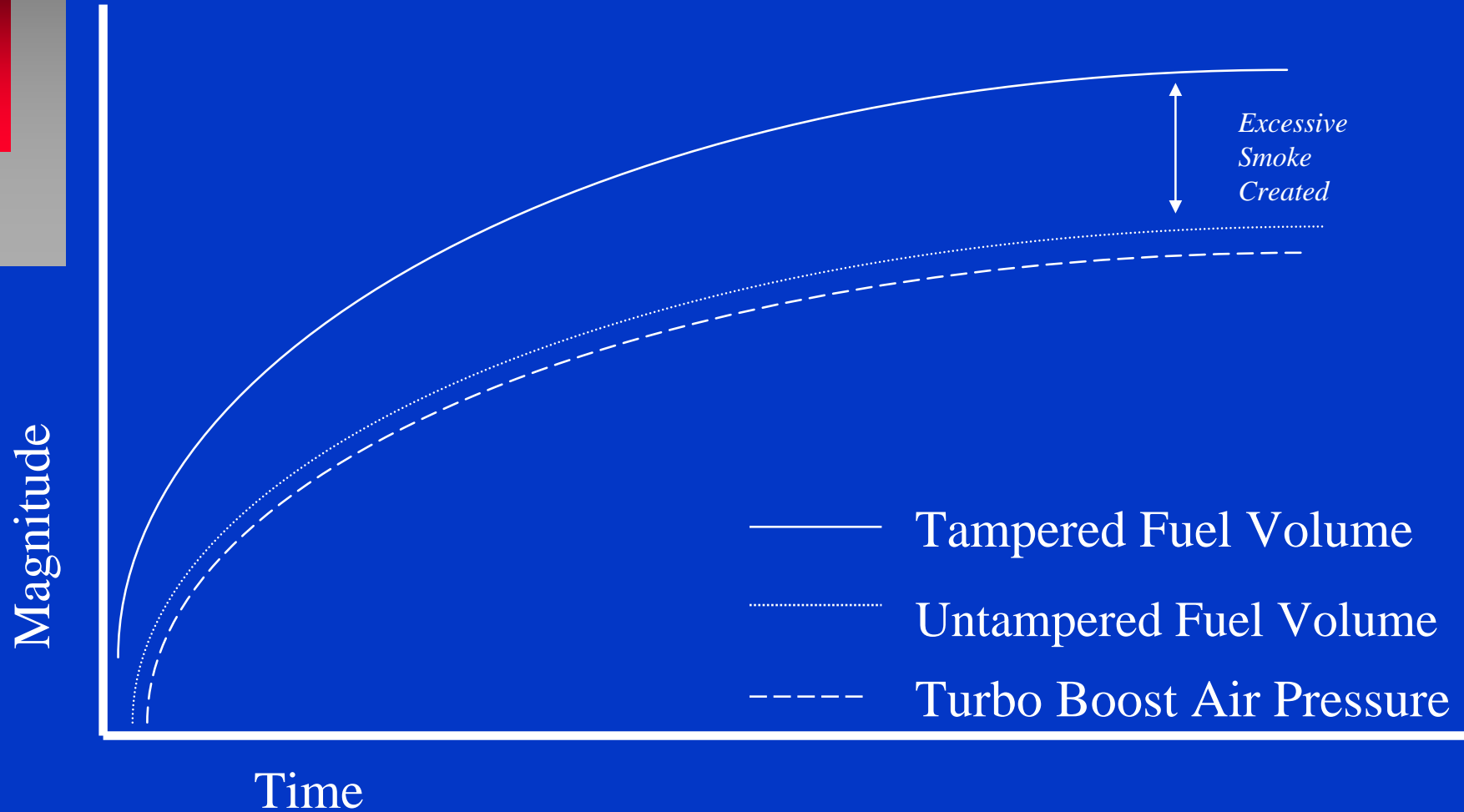
# *Opacity Measurement*

- ◆ Electronic Instrumentation SAE J1667
- ◆ No Visual Ringelmann Scales
- ◆ Digital Print Out

# *Society of Automotive Engineers (SAE) J1667 Test Procedure*

- ◆ Replaces SAE J1243 Test Procedure
- ◆ “Snap Acceleration” Test Cycle Replaces “Snap Idle” Test Cycle
- ◆ Peak Readings now Filtered 1/2 Second Readings
- ◆ Ambient Conditions and Altitude Corrected

# *Tampering Effect on Air/Fuel Ratio*



# *Snap Acceleration Test Cycle*

- ◆ Engines at Operating Temperature
- ◆ Transmission in Neutral, Wheels Chocked
- ◆ Engines Kept Running
- ◆ Rapid Acceleration to Governed Speed
- ◆ Three Clean Out Snaps
- ◆ Three Test Snaps - Averaged
  - Closest Peak Smoke Readings are Averaged



# *Snap Acceleration Merits*

- ◆ Easy to Perform
- ◆ Safe and Quick
- ◆ Perform Anywhere



# *Snap Acceleration Merits*

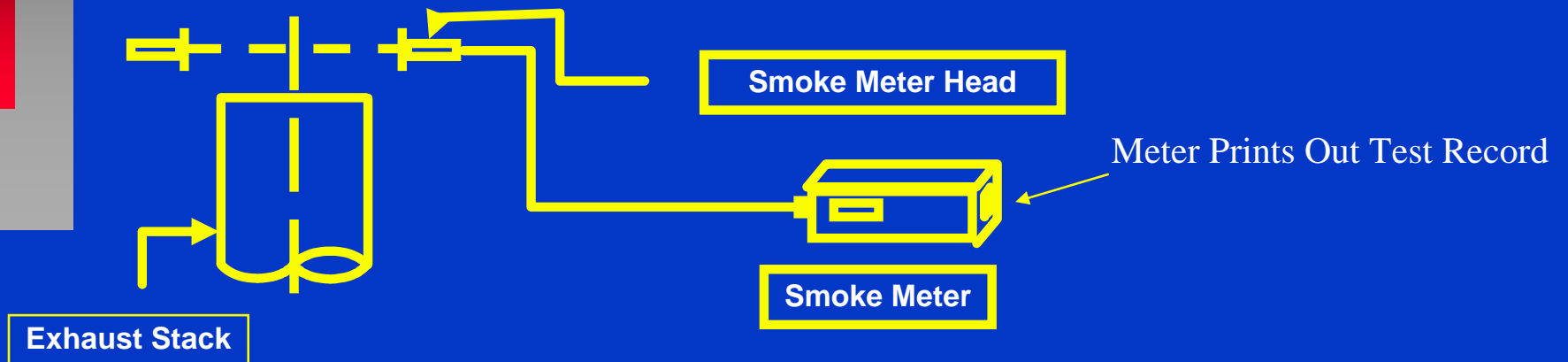
*(Continued)*

- ◆ Industry Approved Through the SAE J1667 Committee (ATA, CTA, EMA, Gov't Agencies, and Opacity Meter mfr.'s)
- ◆ Facilitates Meter Usage
- ◆ Very Effective
- ◆ Diagnostic Tool  
(To Detect Over Fueling and Air Restriction)

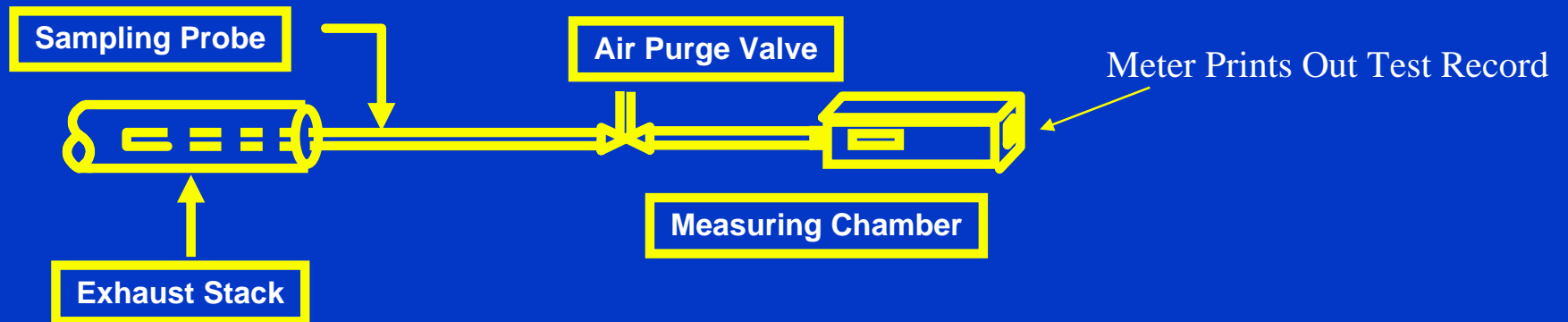


# Test Instrumentation

## End-Of-Line Smoke Meter (eg "Full Flow")



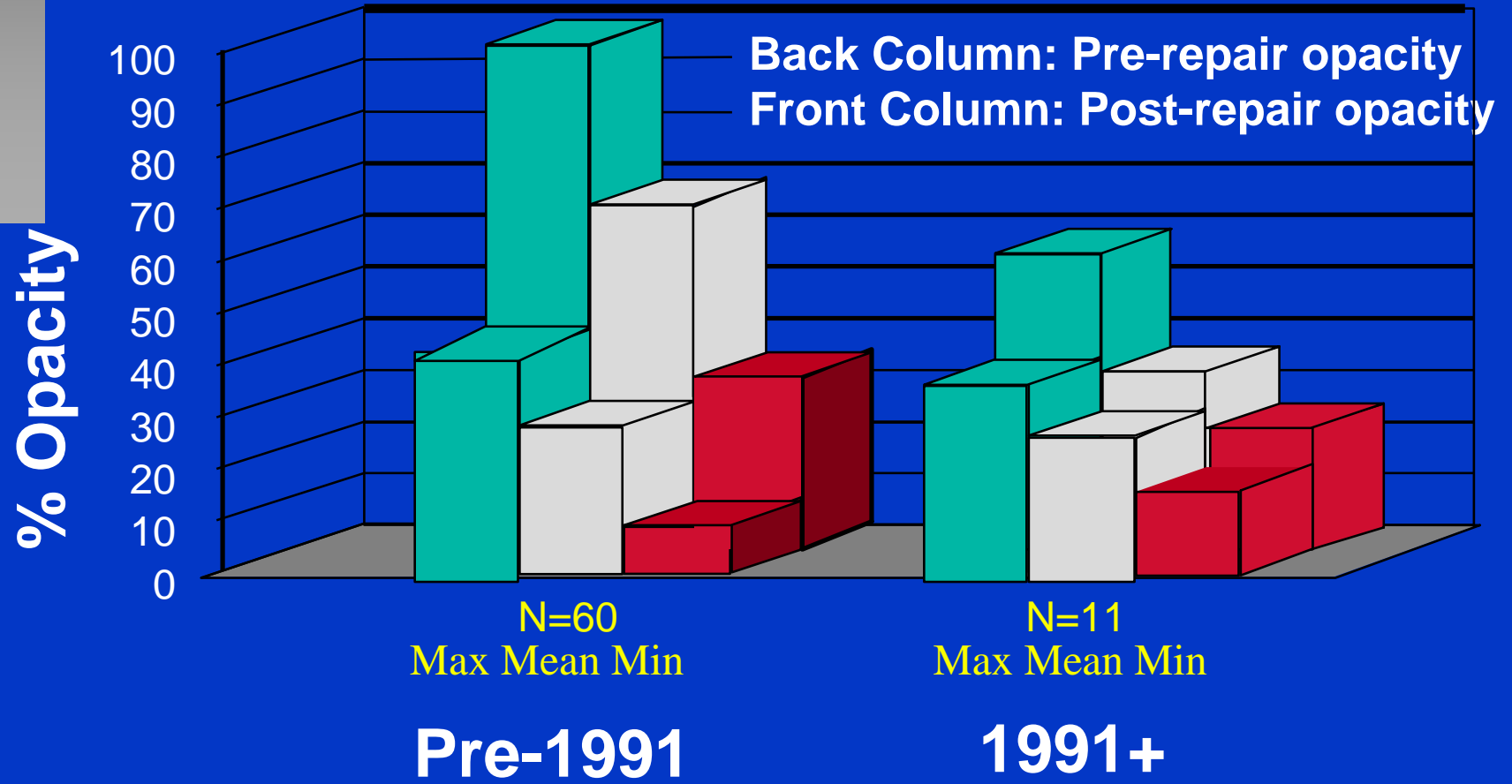
## In-Line Smoke Meter (eg "Partial Flow" or "Sample")





# *Smoke Reduction After Repair*

## *ARB Truck Repair Study (1997)*



# *Smoke Opacity Standards*

Vehicles with Pre-1991 Model Year Engines

*Opacity Standard 55 %*

**Test Opacity**

**ARB Action**

**Post-Repair Standard**

$\geq 70 \%$

Issue Citation

$< 55 \%$

55 - 69 %

Issue Notice of Violation (NOV)\*

$< 55 \%$

\* : Only One NOV is Allowed in a 12 month Period Subsequent Violations,  
Between 55 - 69 % Opacity Result in a Citation

# *Smoke Opacity Standards*

Vehicles with 1991 and  
Newer Model Year Engines

*Opacity Standard 40 %*

**Test Opacity**

**ARB Action**

**Post-Repair Standard**

$\geq 40 \%$

Issue Citation

$< 40 \%$

# *Tampering Inspections*

## Diesel

- ◆ Governor
- ◆ Trap
- ◆ Seals
- ◆ Fuel Pump and Seals
- ◆ Others

## Gasoline

- ◆ Catalyst
- ◆ E.G.R
- ◆ Air Injection
- ◆ Disconnected Hoses
- ◆ Evap System
- ◆ Others

# *Inspection Location*

- ◆ CHP Inspection Facilities / Scales
- ◆ Fleet Yards
- ◆ Random Roadsides

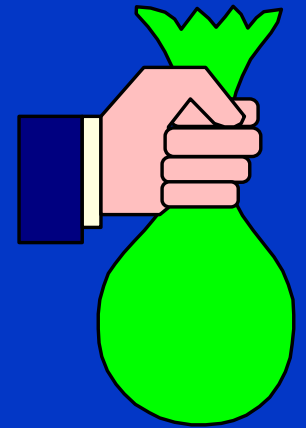


# *First Violation*

- ◆ \$800.00 Penalty
- ◆ Reduced to \$300.00 if Engine Repaired in 45 days
- ◆ School Buses Exempt From \$300.00 Penalty First Violation Only

## *CORRECTIVE ACTION*

- ◆ Penalty Payment
- ◆ Valid Repair Receipt and Post Repair Test



# *Second / Subsequent Violations*

- ◆ Issued Within One Year of First Violation
- ◆ \$1,800.00
- ◆ No Penalty Reduction

## *CORRECTIVE ACTION*

- ◆ Overdue Penalty Payment
- ◆ \$1,800.00 Penalty Payment
- ◆ Mandatory ARB Post Repair Test

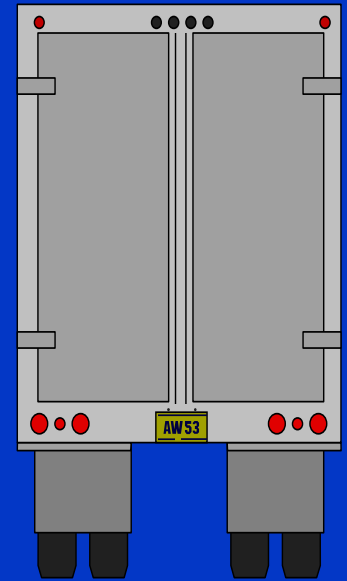


# *Out of Service*

- ◆ CHP Action at ARB Request
- ◆ Vehicles Towed and Stored

## *CORRECTIVE ACTION*

- ◆ Repair Vehicle Within 15 Days
- ◆ Mandatory ARB Post Repair Test
- ◆ Payment of All Storage, Repair and Pending Penalties





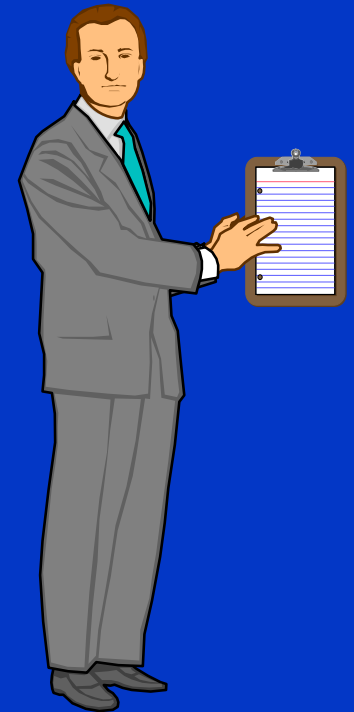
# *Hearings*

- ◆ By Administration Law Judge
- ◆ Requested Within 45 days of Receiving Citation
- ◆ Appeal Process  
Title 17, CCR 60075.1  
(Senate Bill 1874 of 1990)



# *Causes of Excessive Smoke*

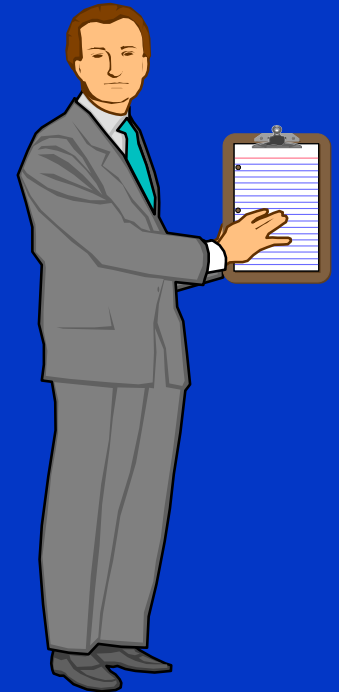
- ❖ Worn/Failed Injectors
- ❖ Maladjusted Fuel Pump Timing
- ❖ Clogged Air Filter
- ❖ Damaged Turbo
- ❖ Worn Engine



# *Causes of Excessive Smoke*

## *(Continued)*

- ◆ Tampered Smoke Puff Limiter  
(e.g. “anerioid”, “throttle delay”)
- ◆ Boosted Fuel Pump
- ◆ Enlarged Injector Tips
- ◆ Pump Timing Advanced



# *Health and Environmental Effects of Diesel Exhaust Emissions*

## *Constituent*

## *Detrimental Effect*

Particulates

Carcinogenic and  
Mutagenic

HC and NO<sub>x</sub>

Ozone (Smog) Precursors

NO<sub>x</sub> and SO<sub>x</sub>

Acid Rain / Deposition

NO<sub>x</sub> and SO<sub>x</sub>

Impairs Visibility/Fine  
Particulate Formation

Toxic Air Contaminants

Carcinogenic

# *Projected Emissions Benefits*

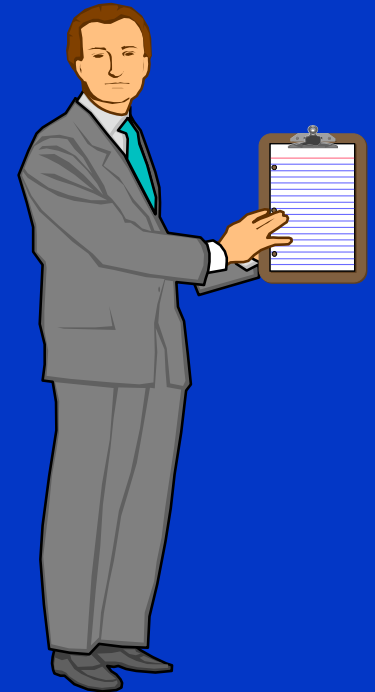
*Combined HDVIP and PSI*

<i>Pollutant</i>	<i>1999 Tons/Day</i>	<i>2010 Tons/Day</i>
PM	5.24	3.19
HC	6.37	5.30
NO <sub>x</sub>	12.24	14.03
<hr/> Totals	<hr/> 23.85	<hr/> 22.52

Reduction of Smoking Trucks: 29 % — 1999, 36 % — 2010

# *Benefits of Smoke Emissions Reductions*

- ◆ Improved Fuel Economy
- ◆ Reduced Fuel Costs
- ◆ Improved Public Relations
- ◆ Cleaner Trailers



# *Estimated Fuel Savings*

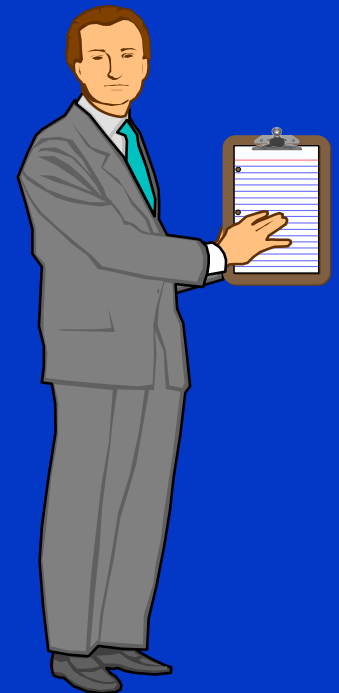
## *1999*

- ◆ 16.7 Million gals/yr
- ◆ 0.69 % Reduction in Fuel Consumption
- ◆ \$ 21 Million / Year Savings

## *2010*

- ◆ 19.2 Million gals/yr
- ◆ 0.66 % Reduction in Fuel Consumption
- ◆ \$ 24 Million / Year Savings

□ Based on Diesel Fuel at \$ 1.25 per Gallon



# *Recommendations*

- ◆ Conduct Proper Maintenance  
(Per Manufacturer's Recommendation/Schedule)
- ◆ Prevent Engine Tampering  
(Tampering Constitutes Failure)
- ◆ Test Smoke Levels At Regular Intervals
- ◆ Have Engine Properly Identified  
(Correctly Label Engine)

\*\* Some Engine Families May Be Exempted From The More Stringent Standards Upon Proper Identification





*ARB Smoke Test Procedure*  
*VS*  
*California Vehicle Code 27153.5*

*H & S 44011.6*

- ❖ Electronic Opacity Measurement
- ❖ Snap Acceleration, Stationary Vehicle

*C V C 27153.5*

- ❖ Visual Ringelmann Sighting
- ❖ Ten Second Sighting, Moving Vehicle

# *ARB Smoke Test Procedure*

*VS*

## *California Vehicle Code 27153.5*

### *H & S 44011.6*

- ◆ 40 % Standard,  
1991 and Newer
- ◆ 55 % Standard,  
1990 and older \*

### *C V C 27153.5*

- ◆ Ringelmann 1,  
1971 and Newer
- ◆ Ringelmann 2,  
1970 and Older

\* 70 % or Higher, Citation Issued  
Between 55 - 69 % NOV Issued

# *27153.5 California Vehicle Code Penalty*

◆ 1st Offense \$250.00 to \$2,500.00

◆ 2nd Offense \$500.00 to \$5,000.00

# *Key Program Elements*

- ◆ Enforcement Implementation:  
June 1, 1998
- ◆ California Highway Patrol Assistance
- ◆ Snap Acceleration Test (SAE J1667)  
(Diesel Vehicles Only)
- ◆ Electronic Smoke Measurement  
(Smoke Meter)
- ◆ Emission Control System Tampering Check  
(Gas & Diesel)

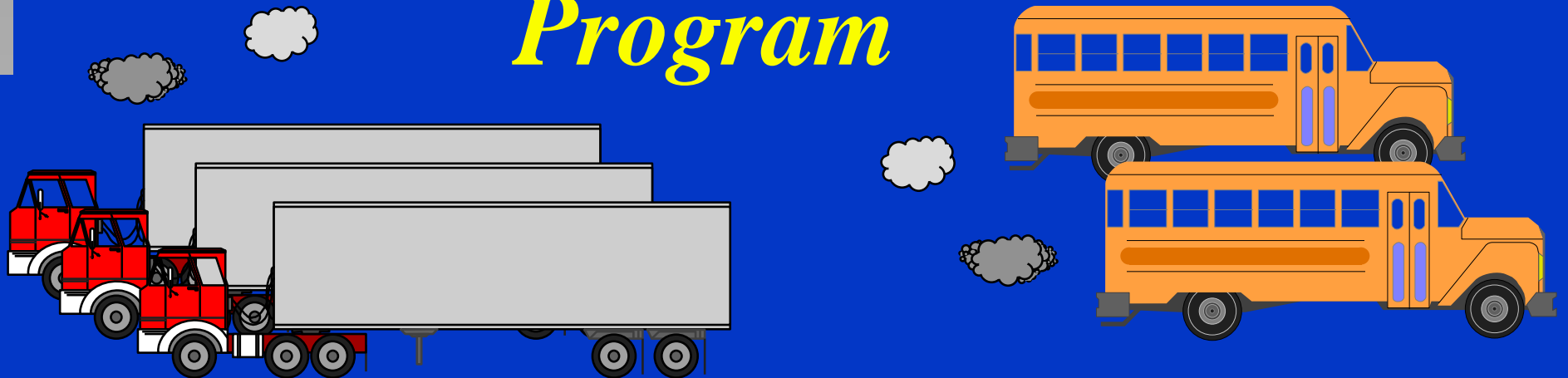
# *Key Program Elements*

## *Continued*

- ◆ Computerized Prior - Violation Check
- ◆ Inspections Conducted at CHP Weigh Stations/Fleets/Random
- ◆ California, Out-of-State, and Out-of-Country (NAFTA) Trucks & Buses
- ◆ Appeal Process  
Title 17, CCR 60075.1  
(Senate Bill 1874 of 1990)

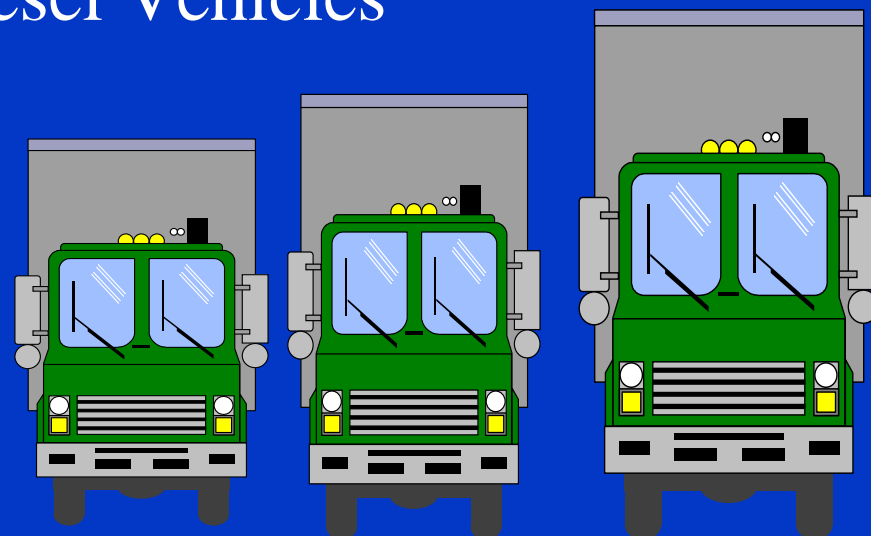
*State of California  
Air Resources Board*

*Periodic Smoke  
Inspection  
Program*



# *Periodic Smoke Inspection Program (PSI Program)*

- ◆ Health and Safety Code 43701(a)
- ◆ Annual Inspection and Test of Diesel Vehicle Fleets.
- ◆ Address Public's Concerns About the Health Impacts of Smoke Emissions From Heavy Duty Diesel Vehicles



# *PSI Goals*

- ◆ Reduce Excessive Smoke Emissions from Heavy Duty Diesel Vehicles
- ◆ Detect Mal-Maintenance and/or Tampering of Heavy Duty Diesel Vehicles
- ◆ Emphasize Use of Manufacturer Specified Tune-Up and Maintenance Procedures



# *Health and Safety Code*

## *Section 43701 (a)*

- ❖ Consult with the Bureau of Automotive Repair and the Inspection and Maintenance Review Committee
- ❖ Adopt Regulations Which Require the Owners or Operators of Heavy Duty Diesel Vehicles to Perform Periodic Smoke Inspections on Their Vehicles

# *California Code of Regulations*

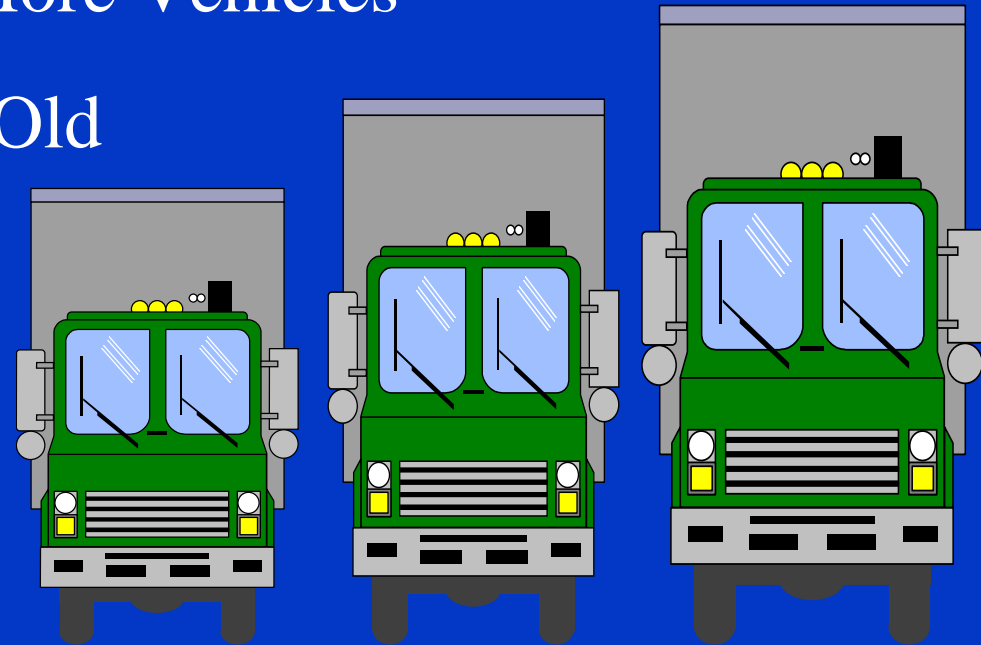
## *Title 13, Sections 2190 - 2194*

*Establishes :*

- ◆ Applicability and Exemptions
- ◆ Inspection Intervals, Test Procedures, and Smoke Opacity Standards
- ◆ Vehicle Inspection Responsibilities
- ◆ Record Keeping Requirements

# *PSI Applications*

- ◆ California - Only Based Vehicles
- ◆ Vehicles Over 6000 GVWR
- ◆ Fleets of Two or More Vehicles
- ◆ Engines > 4 Years Old



# *Smoke Opacity Test Procedure*

- ◆ Perform the Snap Acceleration Test as Used in the Heavy Duty Vehicle Inspection Program
- ◆ Measure the Exhaust Smoke Opacity Level with a Smoke Meter
- ◆ Record the Exhaust Smoke Opacity Level

\*\* Use SAE J1667 Test Procedures and Opacity Meters

# *Vehicle Inspection Responsibilities*

- ◆ Perform the Snap Acceleration Test on Heavy Duty Diesel Vehicles
- ◆ Repair the Vehicles When the Smoke Opacity Standards are Exceeded
- ◆ Re-Test the Vehicles When There are Initial Failures of Snap Acceleration Test
- ◆ Make Additional Repairs When Necessary to Comply with the Smoke Opacity Standards

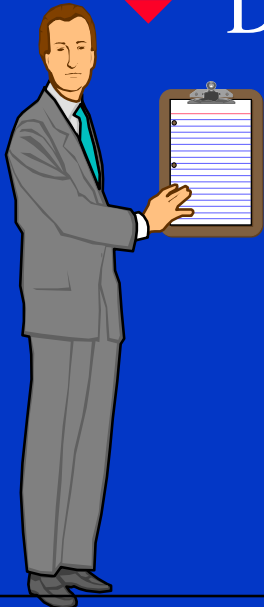
# *Vehicle Inspection Responsibilities*

## *(Continued)*

- ◆ Record the Snap Acceleration Test and Vehicle Repair Information
- ◆ Maintain the Records for Two Years
- ◆ Permit an ARB Inspector to Review/Audit the Records by Appointment

# *Record Keeping Requirements*

- ❖ Hardcopy or Disk/Tape Storage Accepted
- ❖ Document the Test Equipment Information
- ❖ Document the Snap Acceleration Test Results
- ❖ Document the Vehicle Repair Information



\*\* See Recommended Log Sheet

# *Exemption From PSI Program*

## *Heavy Duty Diesel Vehicles Which :*

- ◆ Are < 4 Years Old
- ◆ Are Not Part of a Fleet of Two or More Vehicles
- ◆ Operate in California Under Short-Term Vehicle Registration or Permits of 90 Days or Less



# *Exemption From PSI Program*

## *(Continued)*

*Heavy Duty Diesel Vehicles Which Are Not Based in California and Which :*

- ❖ Are Registered Under the International Registration Plan
- ❖ Operate in California Under Terms of Interstate Reciprocity Agreements or Other Apportioned Registration, Reciprocity or Bilateral Prorate Registration Agreements

# *Key Program Elements*

- ◆ Use SAE J1667 Test Procedure with Snap Acceleration Cycle
- ◆ Apply 40% or 55% Opacity Standards
- ◆ Owner Must Repair Failed Vehicles
- ◆ ARB May Test Fleet Vehicles
- ◆ Citations May be Issued
- ◆ Fleet Audits

# *Your Program Benefits*

- ◆ Increased Fuel Economy
- ◆ Improved Engine Reliability and Extended Engine Life
- ◆ Reduced Emergency Downtime
- ◆ Convenient and Decentralized Smoke Level Evaluation

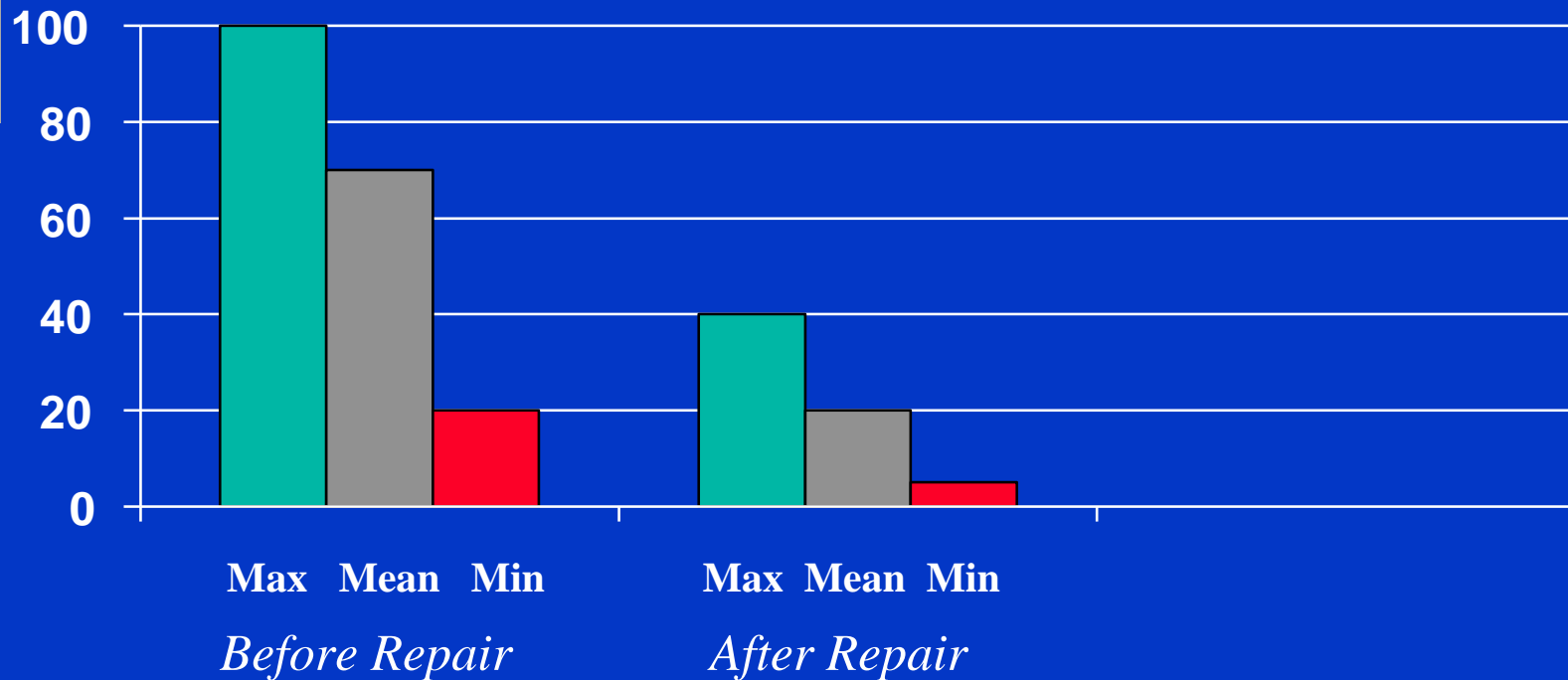
# *Your Program Benefits*

## *(Continued)*

- ◆ No Citations
- ◆ Enhanced Public Image
- ◆ Reduced Emissions

# *Smoke Reduction After Repair ARB Pilot Repair Program (1989)*

## **Peak Smoke Opacity (%)**

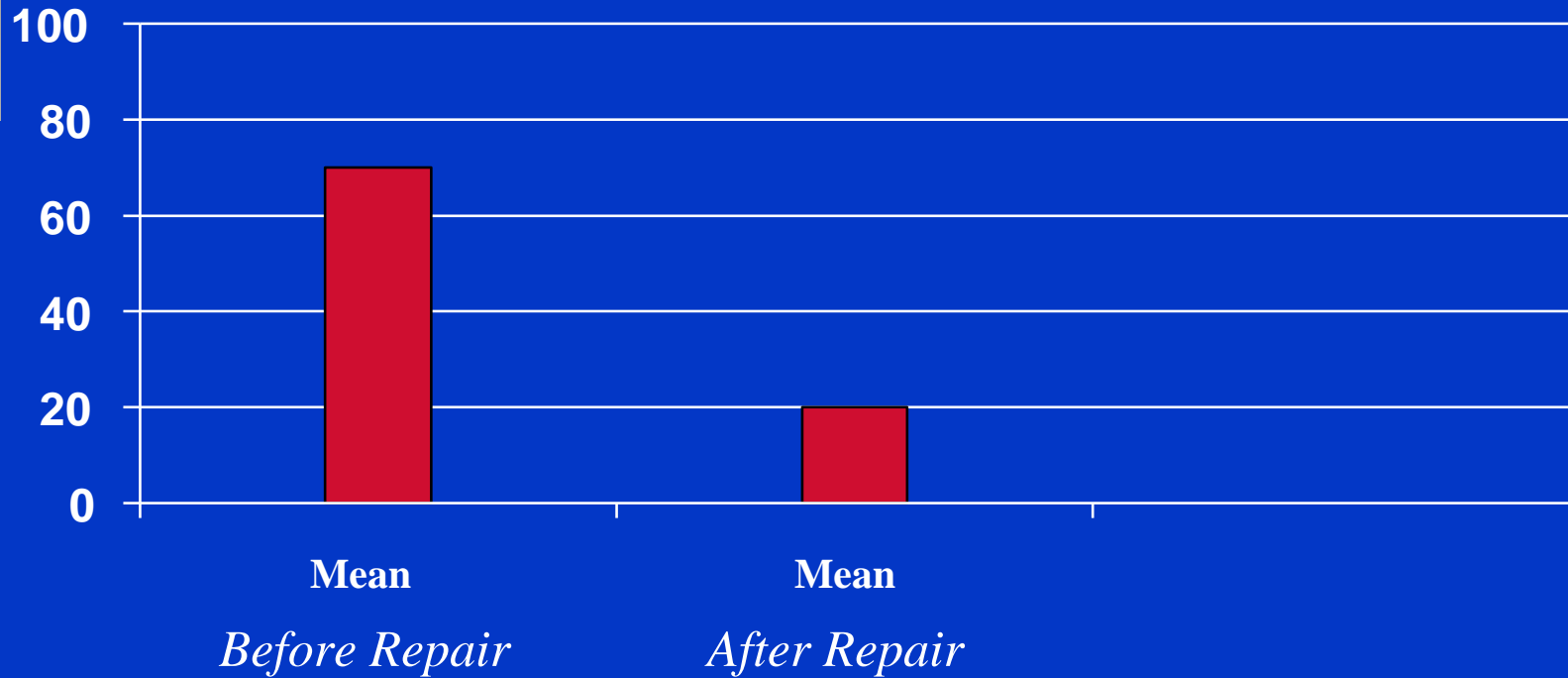


*Sample Size: 58 Vehicles - Repaired to Manufacturers Specs*

# *Smoke Reduction After Repair*

## *ARB Pilot Repair Program (1989)*

### **Peak Smoke Opacity (%)**



*Sample Size: 58 Vehicles - Repaired to Manufacturers Specs*