



# U.S. Experience with Lead Phase-out

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# Introduction

- ⌘ In the 1970's, lead concentrations in U.S. cities were at hazardous levels
- ⌘ The U.S. also wanted to introduce clean vehicles with catalysts



# Standards for Lead in Gasoline

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- ⌘ Lead was reduced from 2.4 grams/gallon in 1974 to 0.1 gram/gallon by 1986
- ⌘ Lead was banned in 1995
- ⌘ Average blood lead content dropped by more than 85 percent



# Valve Seat Recession

- ⌘ Lead deposits on valve seats prevent abrasive wear
- ⌘ Some older engines may have soft valve seats



# Valve Seat Recession

- ⌘ Cars operating under normal conditions show little valve seat wear
- ⌘ Army found no problems with jeeps, trucks, tractors, motorcycles, or combat vehicles



# Vehicle Maintenance Benefits

- ⌘ Exhaust systems
- ⌘ Tune-ups
- ⌘ Oil Changes



# Exhaust Systems

- ⌘ Leaded fuel exhaust is more acidic than unleaded
- ⌘ Accelerates tailpipe and muffler corrosion
- ⌘ Mufflers last twice as long with unleaded fuels



# Tune-ups



- ⌘ Lead deposits on electrodes shorten spark plug life
- ⌘ Unleaded fuel increases plug life by about 80 percent



# Oil Changes

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- ⌘ Lead deposits cause corrosion
- ⌘ Engine oil collects corrosion debris
- ⌘ Oil changes are needed more frequently to assure good performance



# Improved Emission Performance

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- ⌘ Unleaded fuel made catalyst cars possible
- ⌘ Hydrocarbons were also lower due to fewer combustion chamber deposits



# Improved Fuel Economy

- ⌘ Increased energy of the gasoline by more intensive processing
- ⌘ Reduced spark plug fouling
- ⌘ Exxon study found a 1 to 5 percent improvement



# Implementation

- ⌘ Fuel nozzles were made smaller for unleaded fuel
- ⌘ Catalyst cars were equipped with inlet restrictors



# Compliance and Enforcement

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- ⌘ Gasoline stations were inspected
- ⌘ Gasoline nozzles were measured
- ⌘ Fines up to \$10,000 per day



# Problems with Enforcement

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- ⌘ Leaded gasoline cost less than unleaded
- ⌘ Drivers believed that that leaded gas gave better performance

