

Fuel Quality and Alternative Fuels – Synthesis of New Delhi Workshop

Nazir Abbas Zaidi

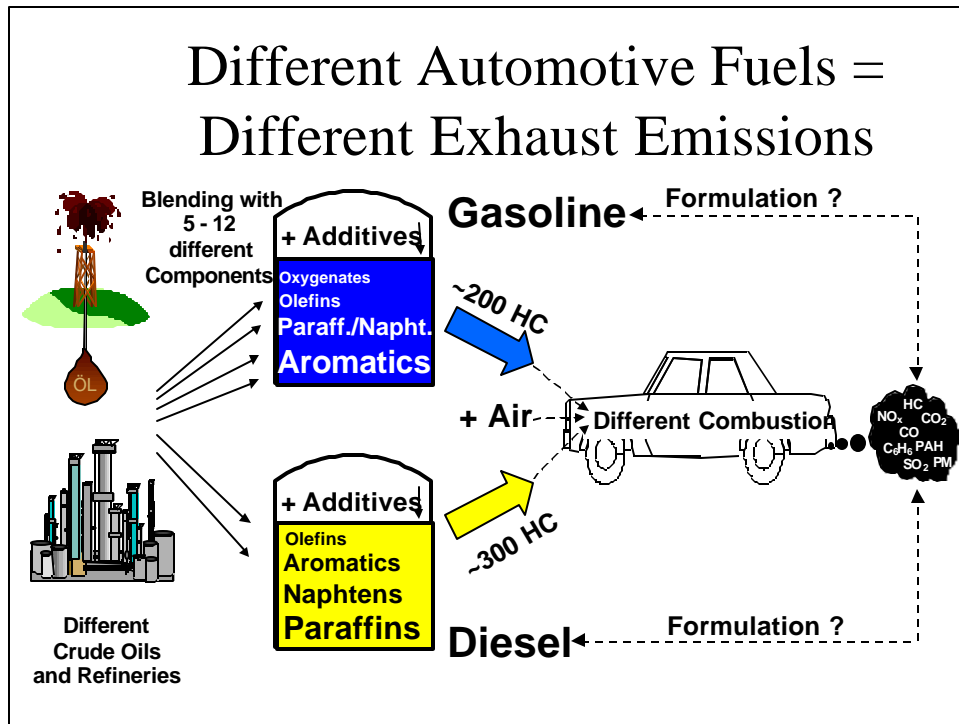
Manager, Health Safety Environment

Pakistan State Oil

Concluding Workshop: Reducing Vehicle
Emission Project 28 February - 1 March, 2002
Manila Philippines

Overview

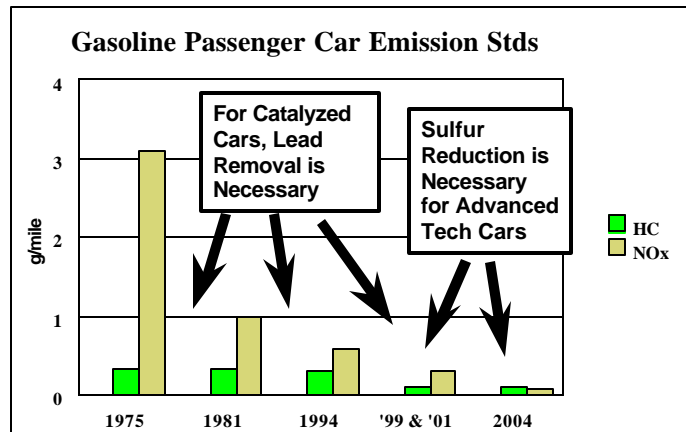
- Conventional Fuels
 - Technology Enabling
 - Reduce Emissions
- Alternative Fuels
 - CNG
 - LPG
 - Other



Enabling Emissions Control

- For emissions control of both diesel fuel and gasoline-powered vehicles, enabling emissions control hardware with improved fuel is crucial.
- Examples:
 - Lead phase-down,
 - Sulfur control of gasoline and diesel fuel,

Enabling Emissions Control Gasoline Cars and Trucks



Enabling Emissions Control Gasoline Cars and Trucks

- Phase-down of Lead is necessary to allow the use of catalysts; also it improved spark plug life.
- Lead cannot be added to gasoline and it must be <0.05 g/gal.
- Potential damage to soft valve seats in older cars did not materialize, so phase-in is not necessary.

Enabling Emissions Control Gasoline Cars and Trucks

- Sulfur reduction allows catalysts and O₂ sensors to operate efficiently.
- Lower sulfur is helpful with lower technology engines and is necessary with higher technology engines.
- Lower sulfur reduces NO_x, HC and CO emissions from catalyst cars.
 - EU Has adopted 50 PPM Maximum in 2005; will soon require 10 PPM
 - US Has adopted 30 ppm Average Requirement

Other Important Gasoline Characteristics

- Volatility
- Aromatics/Benzene
- Deposit Control Additives

EU Fuel specifications

Mandatory fuel specifications for gasoline and diesel in two stages - 2000 and 2005 Closely Linked To Vehicle Standards:

Petrol	2000	2005	Diesel	2000	2005
RVP summer	60	-	Cetane # (min)	51	-
Aromatics	42	35	Density 15°C	845	-
Benzene	1	-	Distillation	360	-
Olefins	18	-	Polyaromatics	11	-
Oxygen	2,7	-	Sulphur	350	50
Sulphur	150	50			

Maximum specifications except where indicated

Enabling Emission Control Diesel Cars and Trucks

- **Particulate Control**
 - Oxidation Catalysts Require Maximum of 500 PPM Sulfur
 - Oxidation Catalysts Perform Even Better with Lower Sulfur
 - Catalyzed PM Filters Require Maximum of 50 PPM Sulfur
 - Catalyzed PM Filters Perform Even Better With Lower Sulfur
 - EU Considering 10 PPM Maximum
 - US Has Adopted 15 PPM Maximum

Enabling Emission Control Diesel Cars and Trucks

- NOx Control
 - Sulfur reduction helps to enable cooled EGR for NOx control
 - Deep sulfur reduction is necessary for advanced aftertreatment to reduce NOx
 - EU Adopted 50 PPM and Considering 10 PPM Maximum
 - US Has Adopted 15 PPM Maximum
 - Japan Has Adopted 50 PPM, Considering Lower

Enabling Emissions Control Other Benefits from Sulfur Control


- Sulfur reduction reduces SO₂ emissions.
 - Less sulfate formation in the atmosphere (about 1/3 of SO₂ reacts to sulfate)
 - Reduced acid rain.
- Sulfur reduction reduces engine wear.
 - Reduction from 2500 ppm to 500 ppm reduces engine wear 10 - 20%; about 33% if starting out at 5000 ppm.
 - Greater engine wear with infrequent oil change.

Why Use Alternative Fuels?

- Petroleum Displacement
- Energy Diversity
- Air Quality Improvement
- Greenhouse Gas Emission Reductions
- Domestic Economic Development

Alternative Fuel Vehicles Available Now


- Ethanol
- Natural Gas
- Propane (LPG)


Ford F-150


Natural Gas Vehicles

- Very Low Emissions
- Good Performance
- Lower Cost Fuel
- Limited Range, but Adequate for Most Applications
- Few Refueling Stations
- Higher Cost Vehicle



Honda Civic




New Flyer D40 LF Bus



CNG - Compressed Natural Gas

■ 82 CNG Buses have been used in BKK since 1992



Propane Vehicles

- Low Emissions
- Good Performance
- Cost Similar to Gasoline
- Few Typical Refueling Stations, Many Potential Places to Refuel
- Higher Vehicle Cost

Ford F-150



Ford Club Wagon



Alternative Fuel Vehicle R&D Challenges

- Reduce Natural Gas and Propane Vehicle Cost
- Expand Refueling Infrastructure

Conclusions

- Vehicle Technologies and Fuels Must Be Treated As A System
- In Order To Allow The Use Of The Cleanest Vehicles Technologies, Lead in Petrol Should Be Eliminated and Sulfur Levels in Both Petrol and Diesel Fuel Must be reduced to 50 PPM or Lower
- Other Fuel Properties Can Reduce Evaporative Emissions and Toxicity
- Alternative Fuels Such As CNG and LPG Can Play An Important Role With Some Vehicles