Regional Workshop on Transport Sector Inspection and Maintenance Policy in Asia

Bangkok, 10-12 December 2001

Kiyoyuki Minato
Japan Automobile Research Institute
Air pollution and Traffic congestion

Every day,

We are facing these problems

No Rule

Mixed Traffic, Persons and Motor vehicles

High Sulphur fuels

Poor maintenance
Analysis of Motorcycle and Passenger Car Dissemination (1986 vs 1996)

Number of motorcycles per 1000 persons vs Number of cars per 1000 persons

- Motorcycle dissemination range:
  - Under $1,000
  - Under $10,000

- Passenger car dissemination range:
  - $10,000 and up

Countries included:
- Taiwan, Malaysia, Japan, Italy, South Korea, France, Australia, United Kingdom, Germany, Thailand, South Africa, India
Fighting Urban Air Pollution
From Plan to Action

For Clean Air in Asia,

Technical Approach

• Vehicle Inspection & Maintenance System
• Improved Fuel Quality
3. Develop Vehicle Emission Standards
4. Use of Alternative Fuels CNG,LPG etc.
5. Better Traffic Management (Traffic Congestion)
# Air Pollution in Big Cities

<table>
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<tr>
<th>Source: WHO</th>
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<tbody>
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<td>The Philippines (Manila)</td>
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An atmospheric inside density of each material: compared with the WHO standard.
- **A**: Very low pollution, WHO guidelines exceeded by less than a factor of half.
- **B**: Low pollution, WHO guideline are normally met.
- **C**: Moderate to heavy pollution, WHO guidelines exceed by up to a factor of two.
- **D**: Moderate to heavy pollution, WHO guidelines exceed by up to a factor of three.
- **E**: Serious problem, WHO guidelines exceeded by more than a factor of three.

Source: WHO
For Clean Air in Asia
Viewpoint of Technical Approach

- Clean Vehicle Technology
- Vehicle Emission Control
- Clean Fuels
- Appropriate Maintenance
I. Inspection & Maintenance

(1) I & M programs are key feature of pollution reduction strategies

(2) Simple routine maintenance can reduce emissions dramatically

(3) Older diesels are a major source of SPM
Purpose for Inspection & Maintenance in Japan

- Prevent Air pollution
- Reduce fuel consumption...
- Secure Safety
Market Share in Used-Vehicles

Malaysia (1999)

Indonesia (1998)

Thailand (1998)

Taiwan (1998)
Flowchart of Asia JARI model

**INPUT**
- Energy consumption
  - Gasoline, Diesel, CNG
- Automobile regulations
  - Fuel economy
  - Emissions
- Automobile market
  - Ownership and income
  - Sales
  - Car stock
  - Average car price
  - Diffusion rate of vehicles
- Socio-economic factor
  - Population
  - GDP growth
  - Living expenditure

**OUTPUT**
- International trade scheme
- Living expenditure fn.
- Car stock estimation by 2030
- Emission gases from vehicles estimation by scenario
- Proposition for Energy policy
  - Environmental policy and sustainable development
Passenger Cars and Emission gas Trend

Passenger Cars

Emission gas from Passenger cars

Thailand

Indonesia
Basic Legal system for Vehicle Environmental Pollution Control

Setting of Environmental quality standards for air pollution

Environmental Pollution Control

Air Pollution Standard

Setting of permissible limits for vehicle emissions

Road Vehicle Act (I & M)

Consideration for assurance of permissible limits
Effects of Vehicle Inspections

For Prevention of Environmental Pollution

1. Reduction of Exhaust Emissions
2. Reduction of Noise Emission
3. Saving of Fuel
4. Enhancement of User’s Consciousness for Vehicle Safety and Pollution Control
For International Hamonization of Vehicle Standards

Past

Own “Vehicle safety standards and Environmental Pollution Standards”

Future

International Harmonization of Vehicle Standards

(1) Merits on Administration
   Streamlined International distribution

(2) Merits on Manufacturers
   Standardization of Auto Parts

(3) Merits on Users
   Expanded Choice of Imported Vehicles
   Reduction in Prices of Vehicles
Improved Fuel Quality

Phase out Leaded Gasoline

Reduction of Sulfur Content

(1) Around 85% of gasoline sold worldwide is unleaded.

(2) Quick phase out is possible: Thailand 5 years

(3) Average phase out cost is US$ 1-2 cents/liter
   (refinery modification etc.)
## Leaded to Unleaded Gasoline in Asia

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## Sulfur Reduction Program for Diesel Fuel in Asia

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Sulphur Free Fuels for Diesel Fuel

Maximum sulphur content limits (ppm)

- **Japan**
- **EU**
- **USA**

Final target: sulphur free
Trends in SO$_2$ CO NMHC Concentration in Japan

Sulfur in Diesel Fuel
- 0.5% --> 0.2%
- 0.2% --> 0.05%

Annual Average SO$_2$ Conc., ppm
Annual Average CO, NMHC Conc., ppm

Average at Roadside Air Pollution Monitoring Stations
Government data
Emission Standards

(1) Improved Fuel Quality
(2) Reduce Local/Global Air Pollution
(3) Influence Urban Form
(4) Energy-Saving Measures for Motor Vehicles

CO2 emission reduction

Improvements of Motor Vehicle Fuel Consumption
# Emission Standards in APEC

## Emission Standards in Asia

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## Emission Standards in Europe

### Car
- Step 2
- Step 3
- Step 4

### LDV
- Step 2
- Step 3
- Step 4

### HDV
- Euro 2
- Euro 3
- Euro 4

EURO 1 introduction 1992 & STEP 1 introduction 1992
Comparison of Passenger car Emissions Standards
( Nitrogen Oxide (NOx) limits )

Useful Life (km)

Tier 2 : 193,080km  Euro4 : 100,000km  New-Long : 80,000km

Gasoline

Year

NOx g/km

Tier 2

Tier 1

NLEV

Euro 3

New- short

Euro 4

New-long

Diesel fuel

Year

NOx g/km

Tier 2

Tier 1

NLEV

Euro 3

New- short

Euro 4

New-long
Comparison of Heavy-Duty Diesel NOx & PM Standards

(NOx, PM limits  g/k-Wh)

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<th>PM Limits</th>
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<td>2010</td>
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- **Japan**: New-Short, Euro 3, Euro 4, New-Long
- **EU**: New-Short, Euro 3, Euro 4
- **US**: New-Short, Euro 3, New-Long
Use of Alternative fuels

(1) Advanced biomass to liquid fuel conversion.
(2) Argentina, Egypt and India have major CNG initiative
(3) Economic for vehicles with high annual usage-
    buses, trucks
(4) Tax incentives for clean vehicles
(5) Initial additional capital cost offset by lower fuel.
## Use of Clean-Energy Vehicles

<table>
<thead>
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<th>Subcompacts and small cars</th>
<th>Short</th>
<th>Cruising distance</th>
<th>Long</th>
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<tbody>
<tr>
<td>Electric vehicles</td>
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<td>Hybrid cars</td>
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<tr>
<td>CNG vehicles (in areas offering CNG supply)</td>
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<tr>
<td>Methanol cars</td>
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<td>Diesel-replacement LPG cars</td>
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Traffic Congestion

(1) Economic loss
(2) The main factor of air pollution
(3) Deterioration of public transport service and increase of private car use
Effects of Vehicle Inspections

For Safety of in-use Vehicles

1. **Reduction of Road Traffic Accidents** due to Poor Maintenance
2. **Improvement of Road Traffic Congestion** due to Mechanical Trouble
3. Control of Illegally
   - □ □ □ Modified Vehicles
4. Thoroughness of
   - □ □ □ □ Recall Campaign
Average Speeds of Travel by Regions

Asian cities:
- delay of road construction
- rapid increase of vehicles
- poor traffic light system

Mixed Traffic, Persons and Motor vehicles

EU: 30-40km
USA: 50-60km
Asia: 10-20km
Vehicle speed / Fuel economy & Emission

Vehicle speed: 60-80 km/h is best for
good fuel economy & low exhaust emission
LRT in Asia

Reduction of Traffic Congestion

Reduce air pollution

Bangkok, Thailand

Kuala Lumpur, Malaysia
ITS/EV City Car System Demonstration Project in Yokohama

Control center
- Reservation and billing service
- Telephone and Internet
- Fee payment
- Remote management
- Data entry
- Vehicle monitoring, emergency message
- Audio service
- Information service
- Navigation data
- Battery power warning
- Call button

Member/user

Customer and business partners

Vehicle station
- Unmanned rental service
- ID authentication/rental/return
- Door locking/unlocking
- Fee confirmation

Round trip
One-way trip

Other vehicle stations
Proposition in Asia Countries

- Improved Vehicle Inspection
- Improved Cleaner Fuels
  - phase out leaded gasoline
  - reduction of sulfur contents

3. Improved Vehicle Emissions Standards

4. Promotion for Clean Fuel Vehicles
  - CNG, EV, etc