Vehicle Technology and Fuel Quality in India

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Partnership for Clean Fuels and Vehicles
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New Delhi
About SIAM

- Represent 36 leading vehicle & vehicular engine manufacturers
- Sustainable growth & development of automotive industry
- Focus on technology: environmental and safety
- Channel of communication
- Dissemination of information - publications, conferences
Profile of Vehicle Produced

- Total production 7.2 mn in 2003-04
- Produce about five million two-wheelers
- One million cars

- 2nd Largest Two-Wheeler Manufacturer in the World
- World’s largest Motorcycle Manufacturer is in India
- 2nd Largest Tractor Manufacturer in the World
- 5th Largest Commercial Vehicle Manufacturer in the World
- 3rd Largest Car Market in Asia
Vehicle Population in Major Cities

Source: Motor Transport Statistics of India, 2002-03, Govt of India
Phase in of Technology

• Pre 1990
  – Limited Vehicle Manufacturers
  – Sales of vehicles were not significant
  – No major concerns of Air Pollution from vehicles
  – No major Technology development
    • Carbureted engines used widely
    • No After treatment devices
  – No mass emission regulations
  – Thrust on maximising Diesel production – focus on Public Transportation
  – BIS governed the specification

• Post 1990
  – Introduction of mass emission regulations and tightening of the same
  – Improvement in emission control technologies viz. through Catalytic Converter, MPFI, EGRs, Turbo Charging and After Cooling, evaporative emission control, etc.
  – Upgradation of fuel quality
  – Alternative fuels
Emission Regulations

• 13 Major Cities
  – All new four wheeled vehicles meet Bharat Stage II Emission Norms (BS II)
  – Equivalent to Euro II Emission Standards

• Rest of the Country
  – Bharat Stage I (Euro I Equivalent) Emission Norms
  – Unique Regulations for 2&3 Wheelers

• Notified by Ministry of Shipping, Road Transport and Highways
  – Deliberated by high level committee “Standing Committee for Implementation of Emission Legislation”

• Auto Fuel Policy announced by Government of India
  – Roadmap for introduction of new Emission norms till 2010
  – Fuel Quality & In-Use Vehicle regulations
  – Guiding principles:
    • Technology should not be specified but norms should be laid down by policy makers
    • To the extent auto fuels meet the recommended emissions norms, choice of fuel should not be distorted by way of taxes
New Emission Regulations

• 1\textsuperscript{st} April 2005
  • Euro III equivalent norms for cars and other four wheeled vehicles in 11 cities
  • Euro II equivalent norms in rest of the country
  • New emission standards also for Two-Wheelers across the country

• 2010
  • Euro III / Euro IV Equivalent Standards – To be reviewed in 2006
Gasoline Quality Improvement

• Phasing out of Lead from Gasoline to meet requirement of catalyst fitted vehicles
  • Total phasing out in six years (1994-2000)
  • Lead Free Gasoline across the country w.e.f. 1.2.2000
• Reduction in sulfur to help improve efficiency / life of catalytic converter
  • 0.2% max. to 0.1 % max w.e.f. 1.4.2000
  • 0.05 % Sulfur Gasoline Introduced in Metros w.e.f. 1.4.2000 to comply with Supreme Court Directives on Vehicular Emissions
• Introduction of benzene limit to reduce carcinogenic contents
  • 1% for notified areas
  • 3% for metros
  • 5% for entire country
• Increase in Octane Number – Higher C.R. and improved efficiency
  • 87 to 88 w.e.f. 1.4.2000
  • Premium Grade Gasoline with 93 Octane being supplied in major cities as per demand
Diesel Quality Improvement

• Increase in Cetane Number to reduce emissions
  • 45 To 48 w.e.f. 1.4.2000

• Reduction in sulfur content to reduce particulates
  • 0.25% in entire country w.e.f 1.1.2000
  • 0.05 % sulfur diesel in 13 major cities

• Improvement in the Distillation Specifications to reduce emissions
  • T90 of 366 deg C has been changes to T85 - 350 and T95 - 370 deg C
## Main Features of Gasoline Specification Changes for BS II, BS III & BS IV

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>2000</th>
<th>BS II</th>
<th>BS III</th>
<th>BS IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Octane Quality</td>
<td>AKI replaces RON</td>
<td>88/93</td>
<td>91/95</td>
<td>91/95</td>
</tr>
<tr>
<td>Sulfur Limit</td>
<td>0.10 %</td>
<td>0.05 %</td>
<td>150 ppm</td>
<td>50 ppm</td>
</tr>
<tr>
<td>Benzene Content</td>
<td>3% in Metros (1% in NCR)</td>
<td>3% in Metros (1% in NCR)</td>
<td>1 %</td>
<td>1 %</td>
</tr>
<tr>
<td></td>
<td>5% in rest of the country</td>
<td>5% in rest of the country</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aromatics</td>
<td>No limit</td>
<td>No limit</td>
<td>42 % max</td>
<td>35 % max</td>
</tr>
<tr>
<td>Olefins</td>
<td>No limit</td>
<td>No limit</td>
<td>21/18 % vol max</td>
<td>21/18 % vol max</td>
</tr>
</tbody>
</table>
# Main Features of Diesel Specification Changes for BS II & BS III & BS IV

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>2000</th>
<th>BS II</th>
<th>BS III</th>
<th>BS-IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density@15°C, kg/m³</td>
<td>820-880</td>
<td>820-860</td>
<td>820-845</td>
<td>820-845</td>
</tr>
<tr>
<td>Cetane Number, Min.</td>
<td>48</td>
<td>48</td>
<td>51</td>
<td>51</td>
</tr>
<tr>
<td>Distillation, °C Max</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85 % Vol</td>
<td>350</td>
<td>350</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>95 % Vol</td>
<td>370</td>
<td>370</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>Sulphur, Wt% Max.</td>
<td>0.25(0.05**)</td>
<td>0.05</td>
<td>0.035</td>
<td>0.005</td>
</tr>
<tr>
<td>PAH % Max</td>
<td>-</td>
<td>-</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

** Supplied in 13 Major Cities
Alternative Fuel Related Decisions

- As per orders of the Hon’ble Supreme Court
  - All buses in Delhi to be converted to CNG mode.
  - Autos allowed option of CNG and Petrol.
- Taxis complying to Bharat Stage II allowed with CNG / Petrol / Diesel.
- LPG allowed by Government as an automotive fuel.
- Ministry of Petroleum & Natural Gas (MoP&NG) decided to introduce 5% ethanol blending in gasoline.
- Major cities in India submitted Action Plan to Government of India for introduction of Alternative Fuels

<table>
<thead>
<tr>
<th>VEHICLE CATEGORY</th>
<th>DELHI</th>
<th>MUMBAI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1998</td>
<td>2004 Est</td>
</tr>
<tr>
<td>BUS</td>
<td>6</td>
<td>10,000</td>
</tr>
<tr>
<td>THREE WHEELERS</td>
<td>0</td>
<td>55,000</td>
</tr>
<tr>
<td>RURAL TRANSPORT VEHICLE (RTV)</td>
<td>0</td>
<td>5,000</td>
</tr>
<tr>
<td>TAXI</td>
<td>400</td>
<td>5,500</td>
</tr>
<tr>
<td>PRIVATE CAR</td>
<td>1,000</td>
<td>12,000</td>
</tr>
</tbody>
</table>
Challenges for Introduction of CNG Vehicles

• Limited world-wide experience
• Industry developed vehicles in short span of time
• Affordable cost
• Meeting tough road and weather conditions
• Delhi has set an example for other cities in the country and in this region
• Availability of CNG limited to few parts of the country
Bio-Diesel Programme in India

• Planning Commission, Government of India, has announced a National Mission on Bio-diesel

• Demonstration Project (Phase –1) – 5 years . 5% Bio-diesel blend in diesel in 8 States
  • Phase –II- 5% bio-diesel blend in diesel all over the entire country
  • Phase - III- 10% bio-diesel blend in diesel all over the country
  • Phase –IV- More than 10 % bio-diesel blend in diesel all over the country.

• Field Trials with Bio-diesel blend being undertaken by
  • Automobile Manufacturers
  • Indian Oil Corporation on Bus Fleets in Haryana & Mumbai
  • Proposed by Railways

• Specifications for Biodiesel have been drafted by Bureau of Indian Standards (BIS)
  – Likely to be finalised soon
Future Technologies Explored

• Hybrid Technologies
• Hydrogen Technology
  – Phase I - Hydrogen can be mixed with CNG upto 10% without engine / system modification.
  – Phase II - Hydrogen in CNG being considered upto 30%
  – National Hydrogen Energy Board in India
    • Chairmanship of Minister Ministry of Non Conventional Energy Resources
    • Government
    • Industry
Indian Clean Air Programme (I –CAP)

- $3m programme covering 6 cities in India to be done over 2 years period in two phases.
- Air pollutants inventory & mobile emission source apportionment.
- Vehicle Emission factors generation (over 300 tests) for different types, age profile of vehicles under varying fuel quality including impacts of I&M and traffic mgt.
- Cost benefit thru mathematical modeling analysis / projection of air quality.
- A joint effort funded by Reliance, Indian Oil, HPCL & BPCL
- Effort supported by leading organisations like MOEF, CPCB, ARAI, NEERI, PetroFed, TERI and SIAM
- I-CAP is a collaborative effort.
- ICAP initiated by Oil companies and eventually MoEF has taken the ownership,
I –CAP Phase I & II

• Phase I (Emission inventory & source apportionment)
  • Cities being covered
    – Delhi, Mumbai, Kolkata, Chennai, Bangalore and Pune
  • Emission factors; Agency –ARAI, Pune
  • Source apportionment; Agency –NEERI Nagpur, TERI

• Phase II (Air modeling based on)
  • Vehicle type, size, fuel used
  • Driving speed, mileage & fuel consumption and Vehicle life
  • Emission & deterioration factor
  • Diesel & petrol specs and cost data etc.

• Expert views of international agencies like California Air Resources Board, EPA USA and Shell Global Solutions included in designing the test programme.
Need for an Integrated Approach
– For Clean Air in Transport

Oil Companies

Fuel Quality

Emission Regulations

In-use Vehicles

Vehicle Manufacturers

Alternative Fuels

Traffic Management

Vehicle Users

Government Departments

NGOs

Research Institutions

Judiciary
Challenges

• Introduction of new vehicle Technology and better quality of fuel in a short span of time
• Parallel efforts for development of Alternative Fuel Vehicles and ensuring supply of alternative fuels
• Emission benefits of new technology negated by lack of proper maintenance and Inspection regime of vehicles
• Fuel Adulteration problems
Thank You!

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