# B S VI
# Fuel Supply
# and
# Quality Up-Gradation

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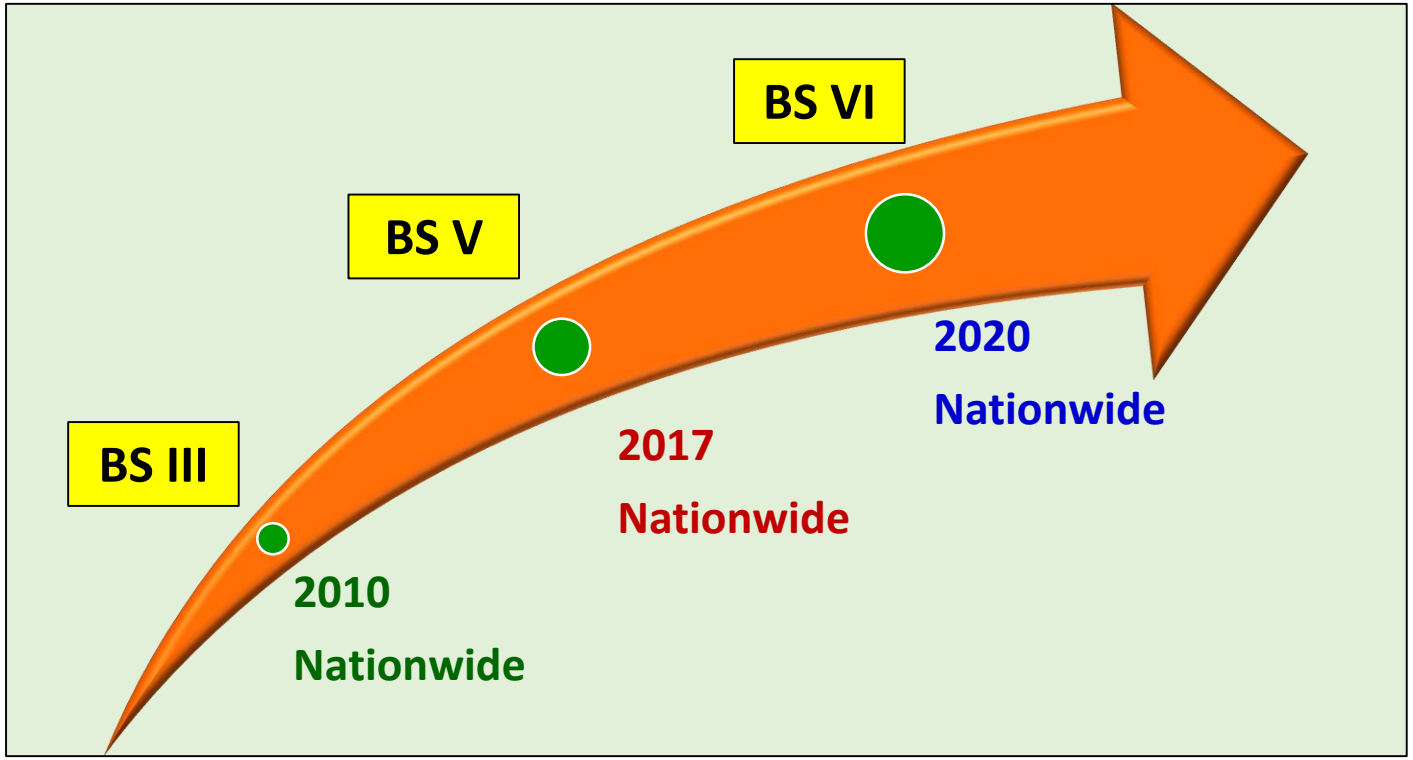
# Changes in the Emission Norms



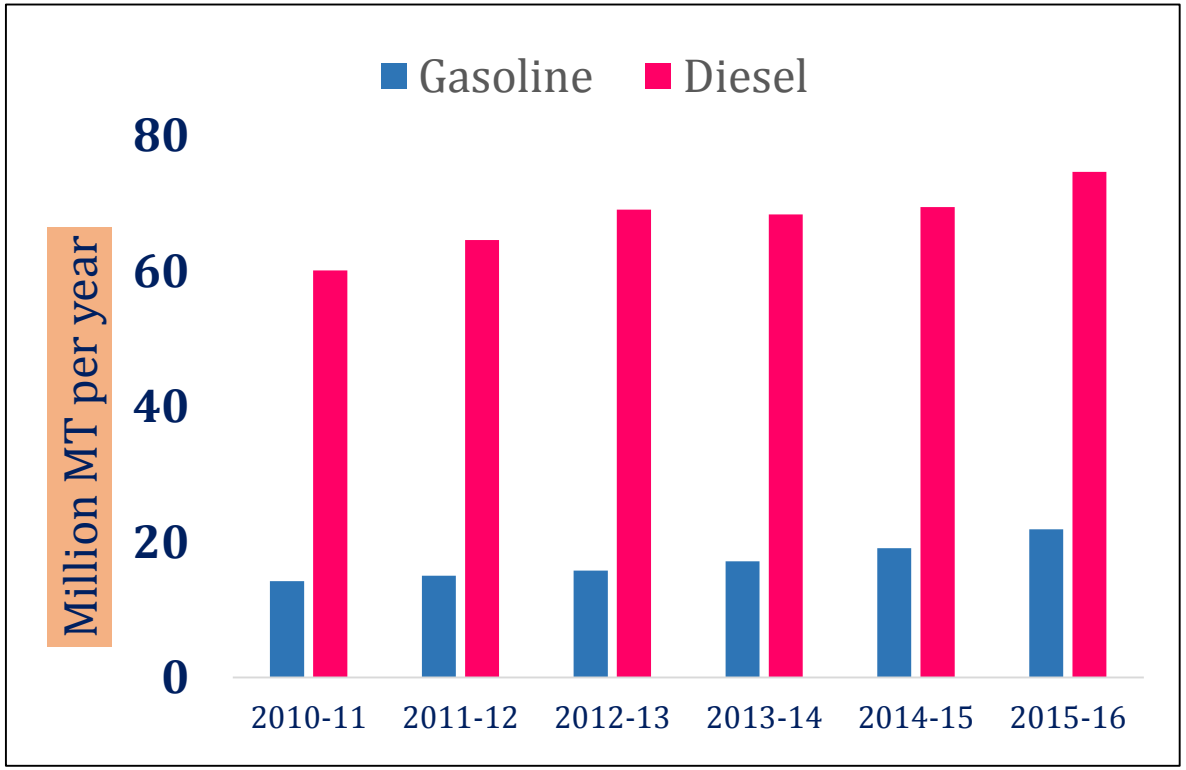

**BS IV norms were initially introduced in 13 cities in April 2010 along with BS III . Later on, more cities and regions were added in 2014-2016 period .**

**Shift from BS IV to BS VI in four years by passing BS V**

# Auto Fuels in India - Demand

## Gasoline & Diesel Consumption

| | Consumption MMT | |
|---|---|---|
| Period | Gasoline | Diesel |
| 2010-11 | 14.192 | 60.071 |
| 2011-12 | 14.993 | 64.57 |
| 2012-13 | 15.744 | 69.08 |
| 2013-14 | 17.128 | 68.364 |
| 2014-15 | 19.075 | 69.416 |
| 2015-16 | 21.846 | 74.647 |

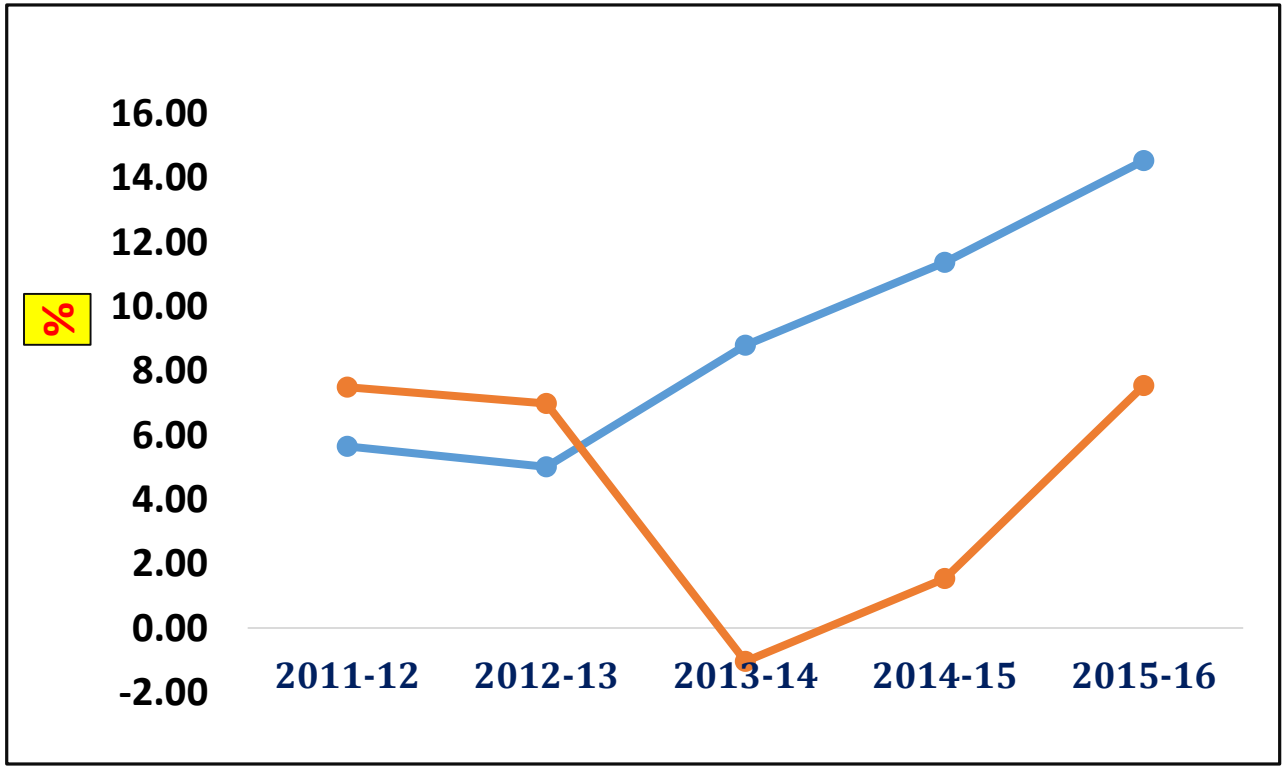



Source : PPAC Data

# Auto Fuels in India - Growth

## Gasoline & Diesel Growth

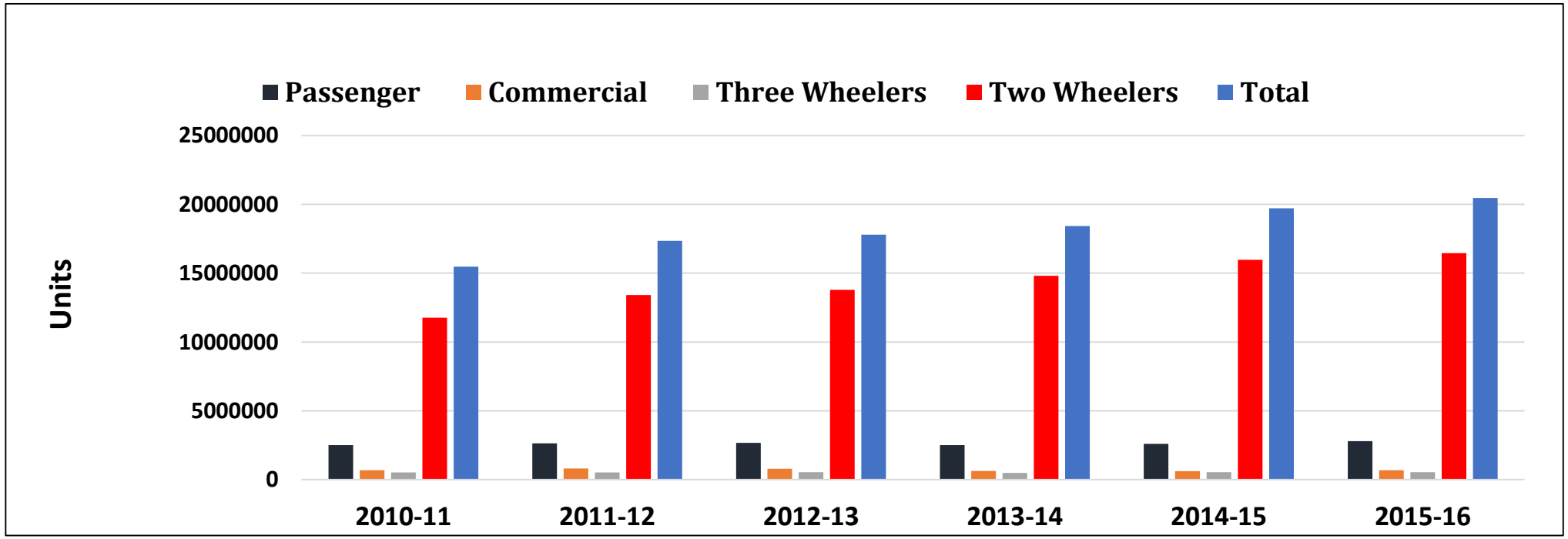
| | Gasoline % Growth | HSD % Growth |
|---|---|---|
| 2011-12 | 5.64 | 7.49 |
| 2012-13 | 5.01 | 6.98 |
| 2013-14 | 8.79 | -1.04 |
| 2014-15 | 11.37 | 1.54 |
| 2015-16 | 14.53 | 7.54 |




Source : PPAC Data

# Sale of Auto Vehicles in India

| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 |
|---|---|---|---|---|---|---|
| Passenger | 2501542 | 2629839 | 2665015 | 2503509 | 2601236 | 2789678 |
| Commercial | 684905 | 809499 | 793211 | 632851 | 614948 | 685704 |
| Three Wheelers | 526024 | 513281 | 538290 | 480085 | 532626 | 538092 |
| Two Wheelers | 11768910 | 13409150 | 13797185 | 14806778 | 15975561 | 16455911 |
| Total | 15481381 | 17361769 | 17793701 | 18423223 | 19724371 | 20469385 |



# Auto Fuels – Demand Drivers

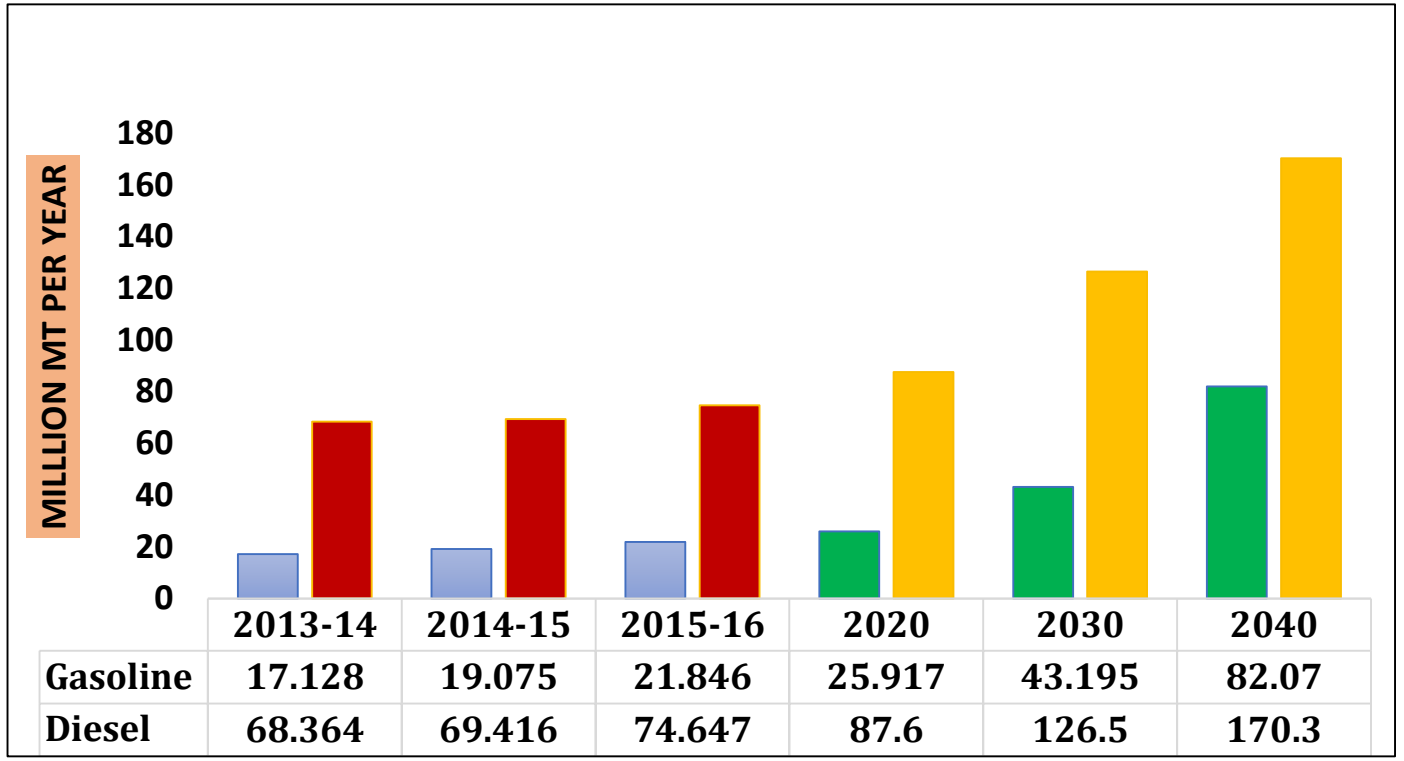
- **Transport Sector – a major consumer of auto fuels**
- **In India 75 MToE (14 % of energy consumed) is the current demand**
- **To reach 240 MToE by 2040**

- **Passenger Cars population to reach from 28 million in 2013 to 280 million by 2040**
- **2/3 wheeler no. will increase by 185 million in current 95 millions**
- **30 million more trucks will be on road by 2040**

**Source : IEA – India Outlook 2015**

# Auto Fuels in India - Outlook

| | Consumption MMT | |
|---|---|---|
| Period | Gasoline | Diesel |
| 2020 | 25.917 | 87.6 |
| 2030 | 43.195 | 126.5 |
| 2040 | 82.07 | 170.3 |




| | 2013-14 | 2014-15 | 2015-16 | 2020 | 2030 | 2040 |
|---|---|---|---|---|---|---|
| Gasoline | 17.128 | 19.075 | 21.846 | 25.917 | 43.195 | 82.07 |
| Diesel | 68.364 | 69.416 | 74.647 | 87.6 | 126.5 | 170.3 |

# Specifications of commercial gasoline E-10

| Characteristics | Unit | BS III (IS 2796:2014, fifth revision , Table ) | | BS IV (IS 2796:2014, fifth revision , Table 4) | | BS VI MORTH Final Notification Dated 16th Sept 2016 (Annex.- IV U) | |
|---|---|---|---|---|---|---|---|
| | | Regular | Premium | Regular | Premium | Regular | Premium |
| Distillation: | | | | | | | |
| a) Recovery up to 70˚C (E 70) | % volume | 10-45 | | 10-55 (summer) 10-58 (other months) | | 10-55 (summer) 10-58 (other month) | |
| RON min | | 91 | 95 | 91 | 95 | 91 | 95 |
| MON min | | 81 | 85 | 81 | 85 | 81 | 85 |
| Reid Vapour Pressure (RVP) @ 38˚C, max | kPa | 60(67) # | | 67 | | 67 | |
| Vapour Lock Index (VLI) | | | | | | | |
| a) Summer, max | | 750(900) # | | 1050 | | 1050 | |
| a) Other months, max | | 950(1050) # | | 1100 | | 1100 | |
| Olefin content, max | % volume | | | 21 | 18 | 21 | 18 |
| Aromatics content, max | % volume | 42 | | 35 | | 35 | |
| Oxygen content, max | % mass | 2.7 | | 3.5 | 3.5 | 3.7 | 4.5 |

# for 5% ethanol blended fuel

Relaxation in Aromatic content for refineries processing Assam crude to 42 up to 1st April 2023

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# Specifications of commercial gasoline E-10

| Characteristics | Unit | BS III (IS 2796:2014, fifth revision , Table ) | | BS IV (IS 2796:2014, fifth revision , Table 4) | | BS VI MORTH Final Notification Dated 16th Sept 2016 (Annex.- IV U) | |
|---|---|---|---|---|---|---|---|
| | | Regular | Premium | Regular | Premium | Regular | Premium |
| **Oxygen content, max** | **% mass** | **2.7** | | **3.5** | **3.5** | **3.7** | **4.5** |
| **Ogygenates content** | | | | | | | |
| **a) Methanol, max** | %volume | - | | - | | 3 | |
| **a) Ethanol, max** | % volume | 4.75 (+)(-) 0.25 | | 9.75± 0.25 | | 10 | |
| **a) Iso-propyl alcohol, max** | % volume | 10 | | - | | 10 | |
| **a) Iso-Butyl alcohol, max** | % volume | 10 | | - | | 10 | |
| **a) Tertiary-butyl alcohol, max** | % vlume | 7 | | - | | 7 | |
| **a) Ethers containing 5 or more carbon atoms per molecule, max** | % volume | 15 | | - | | 15 | |
| **a) Other oxygenates, max** | % volume | 8 | | - | | 8 | |

# Specifications of commercial diesel

| Characteristics | Unit | BS III (IS 1460:2005, fifth revision, Table 1 ) | BS IV (IS 1460:2005, fifth revision , Amendment 2 March 2010, Annex C) | BS VI MORTH Final Notification Dated 16th Sept 2016 (Annex.- IV V) |
|---|---|---|---|---|
| Cetane number (CN), min | | 51 | 51 | 51 |
| Cetane Index (CI), min | | 46 | 46 | 46 |
| Distillation: | | | | |
| 95% vol. recovery at ˚C, max | ˚C | 360 | 360 | 360 |
| Flash Point , Abel, min | ˚C | 35 | 35 | 35 |
| Kinematic Viscosity @ 40 ˚C | cst | | 2.0-4.5 | 2.0-4.5 |
| Density @ 15 ˚C, max | $Kg/m^3$ | 820-845 | 820-845 | 845 |
| Total Sulphur, max | Mg/kg | 350 | 50 | 10 |
| Polycyclic Aromatic Hydrocarbon (PAH), max | %mass | 11 | 11 | 8 |
| FAME content max- | % v/v | | | 7.0 |

Refineries processing Assam crude will have 3 unit relaxation in CN till 1st April 2023

# BS VI Fuels – Quality Issues

- **Gasoline**

**Issue of higher RON (95)**

- **Diesel**

**Issue of - Higher Flash point (42 deg. C)**

**- Higher density (860)**

**- Higher T 95 temp. (370 deg.C)**

**- PAH reduction (8 mass % max)**

# BS VI Gasoline Challenges

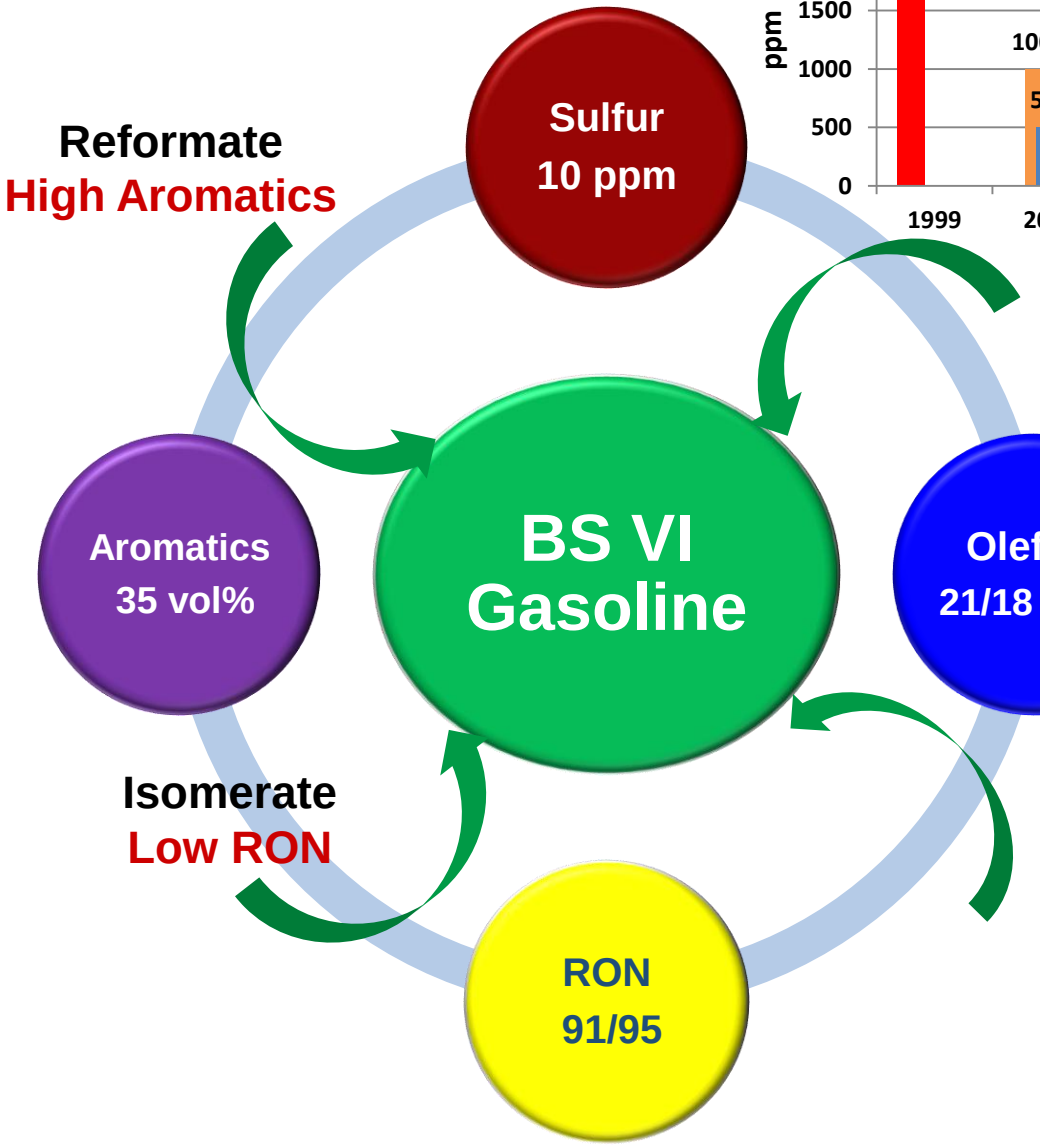
## Maximising 95 RON Gasoline

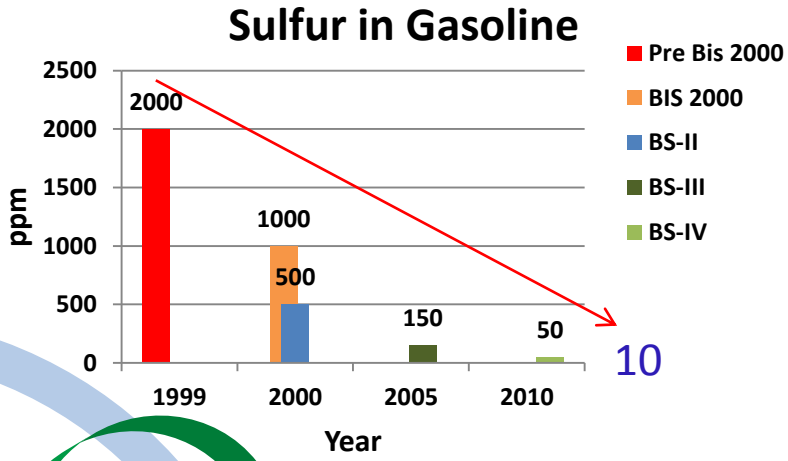
**Conventional Options** :

1. Alkylate

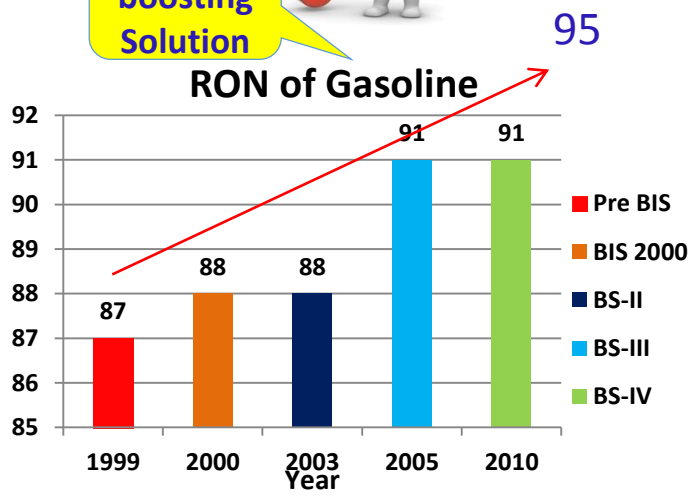
Or

Oxygenates
(MTBE/Tame/ETBE)




FCC gasoline
High Sulfur, Olefins

# Indian refineries – Getting Ready

**Majority of the technological addition / up-gradations are in PSU refineries**

**GASOLINE**

**Introduction of technologies like ISOM unit , Prime G , CCR etc. along with sulphur removing units to balance between various components (aromatics, olefins , Octane no. etc.)**

**Combination of technologies depends on the existing refinery configuration**

**Plus**

**Associated facilities (utilities , tankage etc.)**

**Estimated cost : 12348 / cr.**

# Indian refineries – Getting Ready

- **Diesel**

**Majority of the technological modifications are in Hydro de-sulphurising and hydro- treatment units for deep desulphurisation**

**along with associated facilities like Sulphur Recovery Units , Hydrogen Generation Unit and Utilities etc.**

**Estimated cost : Rs. 16400 / cr.**

# BS VI Fuels – Reaching customers

**BS VI fuels to be in the market from 1st April 2017 PAN India**

**Considering product supply chain from Refineries to customer pump tip , regular production planned to start four months ahead of this date**

**This is to ensure wash out the existing products from the system completely ( storage tanks , pipelines , truck , wagons etc.).**

**Almost NIL sulphur (10 ppm) makes BS VI fuels very quality sensitive .**

**Need to plan and execute logistics systems accordingly with continuous monitoring.**