ULTRA-LOW SULFUR DIESEL UPDATE & FUTURE LIGHT DUTY DIESEL

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2006 DEER CONFERENCE
DIESEL DRIVES AMERICA
U.S. GROWTH IN TRUCK AND BUS FLEETS

Index: 1990 = 1

1.6
1.2
0.8
0.4
0.0


Registered vehicles

Source: U.S. Department of Transportation
U.S. ON-ROAD GASOLINE AND DIESEL DEMAND

Year

MM bpd

0.35
0.3
0.25
0.2

Gasoline

Diesel/Gasoline Ratio

Diesel

0.3
0.25
0.2
0.15
0.1

Source: Axens
DIESELS -
PUBLIC PERCEPTION PROBLEMS

- OLDER TECHNOLOGY
- BLACK CLOUDS OF EXHAUST PARTICULATES
- SMELLY
- NOISY
- CAN BE EASILY REPLACED BY CLEANER FUELS
NEW DIESEL FUEL REGULATIONS

- WILL RESULT IN A NEW CLEANER DIESEL FUEL
- WILL ENABLE NEW CLEANER DIESEL ENGINES
- CAN CHANGE DIESEL’S IMAGE IN THE U.S.
- MAY ALLOW CLEAN DIESEL LIGHT DUTY VEHICLES TO BECOME A SIGNIFICANT PART OF THE U.S. FLEET
MARATHON PETROLEUM COMPANY LLC

- PARENT-MARATHON OIL COMPANY
- FIFTH LARGEST US REFINERY (OVER 1 MILLION BBLS OF CRUDE CAPACITY)
- MAJOR MARKETS IN MIDWEST AND SOUTHEAST
- LARGE FUEL WHOLESALER
- 50% OWNER OF PILOT TRAVEL CENTERS
HIGHWAY DIESEL FUEL REQUIREMENTS

- EPA HAS FINALIZED 2007 HIGHWAY DIESEL VEHICLE AND FUEL STANDARDS
  - 15 PPM SULFUR CAP-JUNE 1, 2006 (AT REFINERIES)
  - TEMPORARY COMPLIANCE OPTION (PHASE-IN)
    - 80% 15 PPM CAP/20% 500 PPM CAP BY 6/1/06
    - 100% 15 PPM CAP BY 6/1/10
  - SMALL REFINERY AND GEOGRAPHIC PROTECTED AREA (ROCKY MTN STATES) EXEMPTIONS
- SEPT 1, 2006 PIPELINES, TERMINALS MUST CONVERT
- OCT 15, 2006 RETAIL LOCATIONS MUST CONVERT
CURRENT STATUS OF HIGHWAY ULSD

- REFINERIES – PRODUCING 2.16 MILLION BBL PER DAY ULSD
- DISTRIBUTION SYSTEM INVENTORY
  - 50% CONVERTED TO ULSD
  - CONVERSIONS PROCEEDING ON SCHEDULE
- RETAIL INVENTORY
  - IS BEING CONVERTED BY DISTRIBUTION SYSTEM
  - SOME UNCERTAINTY ON PRODUCT AVAILABILITY/PRICE
  - STILL TOO EARLY TO PROJECT
Total U.S. Distillate Production

Source: API Weekly Statistical Bulletin
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NON-ROAD DIESEL FUEL REQUIREMENTS

- RULE WILL COVER PART 89 (AGRICULTURE AND CONSTRUCTION) ENGINES
- 2 STEP APPROACH REQUIRES
  - <500 PPM SULFUR FOR PART 89, LOCOMOTIVE, AND MARINE BY 6/1/2007
  - 15 PPM SULFUR FOR PART 89 BY 6/1/2010
- 15 PPM SULFUR FOR RAILROAD AND MARINE DIESEL IN 6/1/2012
### WHAT DOES CURRENT DIESEL FUEL LOOK LIKE?

**2002 National Average Diesel Properties**

(2002 Diesel Fuels Survey, includes California)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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<tbody>
<tr>
<td>API Gravity</td>
<td>34.4</td>
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<tr>
<td>Sulfur, ppm</td>
<td>340</td>
</tr>
<tr>
<td>Flash Point, °F</td>
<td>159</td>
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<tr>
<td>Viscosity, cs 40 °C</td>
<td>2.73</td>
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<tr>
<td>Particulate Matter, mg/l Max.</td>
<td>15</td>
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<tr>
<td>Cetane Index</td>
<td>45.8</td>
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<tr>
<td>Cetane Number</td>
<td>46.4</td>
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<tr>
<td>IBP, °F</td>
<td>367</td>
</tr>
<tr>
<td>T10, °F</td>
<td>424</td>
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<tr>
<td>T50, °F</td>
<td>511</td>
</tr>
<tr>
<td>T90, °F</td>
<td>605</td>
</tr>
<tr>
<td>EP, °F</td>
<td>655</td>
</tr>
<tr>
<td>Aromatics, vol%</td>
<td>27.7</td>
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</table>
WHAT WILL NEW CLEAN DIESEL LOOK LIKE?

- MANY DIFFERENT TECHNOLOGIES WILL BE USED
- VERY SIMILAR TO CURRENT DIESEL WITH MUCH LOWER SULFUR LEVELS
- SULFUR CONTENT
  - MANUFACTURED – 5-8 PPM SULFUR
  - DELIVERED – 15 PPM SULFUR
- CETANE NUMBER – 1-2 NUMBER IMPROVEMENT
- AROMATIC CONTENT – SLIGHTLY LOWER
- ENERGY CONTENT – SLIGHTLY LOWER
- LUBRICITY – WILL MEET ASTM STANDARDS
- COLOR – CLEAR, MAY HAVE GREEN TINT
WHAT NEW CLEANER DIESEL WILL NOT LOOK LIKE IN THE U.S.

Worldwide Fuel Charter Category 4 Diesel

- Specific Gravity, 60/60: 0.82-0.84
- Sulfur, ppm: 5 - 10
- Flash Point, F: 122 Min.
- Viscosity, cs 40 C: 2.0-4.0
- Particulate Matter, mg/l: 24 Max.
- Cetane Index: 52.0 Min.
- Cetane Number: 55.0 Min.
- T90, F: 608 Max.
- T95, F: 644 Max.
- Aromatics, wt%: 15 Max.
- Lubricity, HFRR scar dia.@60 C, micron: 400 Max.
WILL LIGHT DUTY DIESEL ENGINES REQUIRE A DIFFERENT DIESEL FUEL?

- POSSIBLY
- RESEARCH NEEDED INTO THE EFFECTS OF FUEL PARAMETERS ON TIER 2 COMPLIANT DIESEL ENGINES
- ENHANCED PERFORMANCE DIESEL FUEL WILL
  - HAVE TO BE KEPT SEGREGATED FROM HIGHWAY DIESEL FUEL
  - WILL HAVE A HIGHER PRODUCTION COST AND SHOULD CARRY A HIGHER PRICE AT RETAIL LOCATIONS
  - CAN ONLY BE DEVELOPED THROUGH COOPERATION BETWEEN ENGINE/VEHICLE MANUFACTURERS AND FUEL REFINERS
FUTURE DIESEL FUELS & ENGINES

- WILL BE CLEAN BURNING
- WILL HAVE VERY LOW EMISSIONS
- WILL HAVE A NEW AND IMPROVED IMAGE
- WILL CONTINUE TO PROVIDE THE POWER NEEDED BY THE U.S. ECONOMY