Diesel and Hybrid Cars in Europe

Automotive World Briefing
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Al Bedwell
al.bedwell@jdpa.com
Introduction

• Strategies for reducing CO$_2$ output from personal vehicles include improved traffic management, modified driver behaviour and technical improvement to vehicles

• Despite growing awareness of global warming and CO$_2$, drivers are unwilling to change their habits

• So carmakers are increasingly being required to produce low carbon vehicles at little/no extra cost or performance penalty

• Powertrain solutions have provided most of the CO$_2$ reduction over the last decade – will this continue to be the case?

• Diesel is here to stay, but how much more growth will we see?

• The climate for hybrids in Europe hasn’t been right so far, but will pressure for better FE move them from niche to mainstream?

• If so, which technology will win – gasoline or diesel hybrid?
WE Diesel Share is a Function of Tax

W Europe Diesel Passenger Car Shares & Breakeven Distances 2007

Low Diesel Tax

High Diesel Tax

Breakeven Distance (Km)

Diesel Share (%)
Diesel Car Outlook, Germany & France

Diesel Volumes & Share of New Passenger Car Sales

Germany

France

UK &…Norway!

Diesel Volumes & Share of New Passenger Car Sales

UK

Norway

Diesel Volumes & Share of New Passenger Car Sales
Western, Eastern Europe Diesel Outlook

Diesel Volumes & Share of New Passenger Car Sales

W Europe

Volume Share

% Units (mn)

1999 2001 2003 2005 2007 2009 2011 2013 2015 2017

0 10 20 30 40 50 60 70

E Europe

Volume Share

% Units (mn)

2001 2003 2005 2007 2009 2011 2013 2015 2017

0.0 0.5 1.0 1.5 2.0 2.5

Diesel Premium Segment is More Robust

Dieselisation of Market Sectors

• Peak Premium sales – 2.3mn (1.8mn 2007)
• Peak non-Premium sales – 9.2mn (6.8mn 2007)
• Premium is more resilient to future rises in diesel powertrain costs
• Premium may benefit more from company car tax policy
• Typical distance driven is greater than for non-premium
• Absolute financial savings are greater in larger (Premium?) cars
HEVs in Europe – Niche or Mainstream?

• Small volumes, but strong growth
  – Sales in 2007 just 50k, but up 2,000% from 2002!

• Market is constrained by lack of choice
  – Only a few HEVs available, most segments not covered

• Price premium v Gasoline
  – 20% or more, diesel circa 8%

• Hybrid FE is no big deal
  – Diesel is default for those worried about FE/CO₂

• Can hybrids offer value for money?
The Financial Case for Hybrids

• Assumptions:
  • Gasoline hybrid costs 15% more than non-hybrid gasoline
  • Diesel hybrids cost 20% more than non-hybrid gasoline
  • Diesel/gasoline hybrids pay 50% of annual circulation tax/congestion charge of non-hybrid gasoline
  • Mature market – gasoline & diesel hybrid model availability similar to non-hybrid diesel
  • Gasoline hybrid fuel efficiency same as non-hybrid diesel
  • Diesel hybrids achieve 20% better fuel economy than non-hybrid diesel
## Medium Term OEM Hybrid Activity - Europe

<table>
<thead>
<tr>
<th>OEM Group</th>
<th>Comments</th>
<th>2007</th>
<th>2008</th>
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<tbody>
<tr>
<td>Toyota Group</td>
<td>Target 10% of sales 2010. Isuzu link for DHEV</td>
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<td>Honda</td>
<td>Will introduce hybrid-only model in next few years</td>
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<td>M-B</td>
<td>Partner with BMW, GM in two-mode project</td>
<td>ML450</td>
<td>S400</td>
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<td>BMW</td>
<td>Will lag M-B and GM for hybrids</td>
<td>X6</td>
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<td>VW Group</td>
<td>Hybrid for large SUVs first. Little DHEV activity so far</td>
<td>Q7 (end '08)</td>
<td>Touareg</td>
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<td>PSA</td>
<td>Pioneer non-premium DHEV. €2,000 premium over diesel</td>
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<td>306 HDI, C4 HDI</td>
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<td>R-N</td>
<td>Infiniti introduce GHEV. R-N follow PSA DHEV later?</td>
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<td>306 HDI</td>
<td>C4 HDI</td>
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<td>Ford Group</td>
<td>Volvo to get PSA technology?</td>
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<td>Kuga</td>
<td>Volvol</td>
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<td>GM Group</td>
<td>Saab to get 2-mode system?</td>
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<td>Saab</td>
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<td>Fiat Group</td>
<td>Has least need for hybrids, but could share GM tech.</td>
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<td>Punto?</td>
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<tr>
<td>Hyundai Group</td>
<td>Working on in-house GHEV system. Intro delayed</td>
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<td>SUV/Large cars</td>
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<td>Porsche</td>
<td>Will use GHEV to boost performance &amp; lower CO₂</td>
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<td>Tata Group</td>
<td>Land Rover needs CO₂-reducing technology</td>
<td>Land Rover LRX</td>
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<th>Gasoline</th>
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Early Adopters Only

- Premium for full GHEV versus gasoline remains at 20%
- Only a few OEMs enter HEV market
- Not all major market segments covered
- No long term hybrid incentives
- Hybrids are part of the ‘basket’ of choice for a portion of buyers only
- Diesel hybrid too expensive for mass market

HEV Sales & Share in Europe

- HEV sales
- HEV share

mild/full hybrids only

Sales (mn units)
Share (%)
Europe HEV F’cast – Optimistic Scenario

Mass Market Opportunity

- Price premium for full GHEV versus gasoline falls to 10%-15%
- Diesel hybrid premium at 15% to 20% over gasoline
- Most OEMs enter HEV market
- Most market segments covered
- Hybrids are part of the ‘basket’ of choice for most buyers
- Hybrids retain incentives in medium term
Conclusions

• The rate of expansion in the W Europe diesel car market has peaked but further growth will take place

• Some diesel markets are saturated but others are constrained by tax and so have pent-up demand

• Pressure will come to bear on the diesel sector in the next decade from both gasoline sector improvements and EU-6

• Hybrids could play a significant part in CO₂ reduction, but are not yet fully commercially tested in Europe

• Diesel hybrids are better suited to Europe than gasoline hybrids

• Consumer appetite for low carbon vehicles will need suitable government policies

• Continuous improvement of existing powertrains offers the most cost effective medium term solution to CO₂ reduction