



Alternative Automotive Fuels Report

This report looks at the factors currently driving the market for alternative fuels and examines regional policies and usage data. Furthermore, the report considers the biofuel debate, and looks at the use of advanced biofuels in non-oil and non-food feedstocks.

The report also provides a review of the main types of alternative automotive fuels including ethanol, butanol, biodiesel, HDRD, DME, Natural Gas, FT Diesel, Hydrogen and fuel blends.

Background to this Research

Proven oil reserves are growing, but at today's rate of consumption BP's figures suggest that we will run out of oil before 2050 unless new sources or alternatives are brought on stream, or consumption is reduced. And of course it is BP's view that these new sources of oil will be found, but just in case, along with other major corporations BP is also investing in alternatives and ways of reducing consumption.

One response by the automotive sector has been the development of alternative fuel vehicles based on electricity – EVs and HEVs are now available from all major OEMs. But electricity alone cannot meet all the world's up-coming energy requirements for transport. Indeed a consensus is emerging among leading automotive businesses that electric vehicles alone can never fulfil the everyday driver's requirement for all types of journeys. Liquid fuel of some kind, or a sustainable alternative, will be required for long-range sustainable mobility.

Table of contents

INTRODUCTION

WHAT'S DRIVING THE MARKET FOR ALTERNATIVE AUTOMOTIVE FUELS?

- Global Warming and Regulation
- Impact of the OECD/IEA Scenarios
- Peak Oil & the Balance of Supply and Demand
- Sources of Oil & Availability
- The Rate of EV and HEV Take Up
- Competing Uses of Oil
- Market Growth, Drivers & Timing
- Conclusion

WHAT IS AN ALTERNATIVE AUTOMOTIVE FUEL (AAF)?

Definition
Relative Energy Content

REGIONAL AAF POLICY & USAGE

United States
Europe
Latin America
Brazil
Other Latin American Countries
Asia
Japan
China
India

THE BIOFUEL DEBATE

Food vs. Fuel and Other Issues
The 'BioMass Limit'
Solution Trends
Non-Food Feedstocks
Second & Third Generation Biofuels
Biofuel Self Sufficiency vs Importing
Multipurpose Feedstocks
Biodiesel: Environmental Impact, Uptake & Production

ADVANCED BIOFUELS : UTILISING NON-OIL & NON-FOOD FEEDSTOCKS

BTL, CTL & GTL & the Fischer-Tropsch (FT) Process

Biomass Fractionation
Jatropha & Karanja
Algae
Pure Plant Oils (PPO/SVO)
Waste Products
Domestic and Municipal Waste
Waste Vegetable Oil (WVO)
Human waste
Conclusion: Advanced Biofuels – Key Issues

ALTERNATIVE AUTOMOTIVE FUELS – A REVIEW

Ethanol

Overview
Global Production Figures
Distribution
Engine Design Evolution

Use in Diesel Engines

Butanol

A 'Drop-In' Fuel

Who's Investing in the Technology?

Conclusion

Conventional Biodiesel (FAME)

Issues

Hydrogenation-Derived Renewable Diesel (HDRD or HVO)

DME (BlueFuel)

Natural Gas (CNG, LNG)

Overview

Availability & Usage

Conclusion

Synthetic Fuel: FT Diesel

Hydrogen

Controversy

Practicalities

Issues

Hydrogen Sourcing

Hydrogen infrastructure costs

Cost-effective Hydrogen Storage

Reduced fuel cell costs

Fuel cell reliability, durability and low-temperature operation.

Comparative Well to Wheel (WTW) Statistics of AAFs

Conclusion

Fuel Blends

Common Fuel Mixes (E10, E85 HCNG etc)

Liquefied Petroleum Gas (LPG, GPL, LP Gas & Autogas)

P-series Fuel

Methane-Diesel Blends

CONCLUSION

List of Tables and Figures

Figure 1: Forecast Oil Price Rises out to 2035
Figure 2: Distribution of proved oil reserves in 1989, 1999 and 2009
Figure 3: The OECD/IEA Blue Map (450ppm) Scenario
Figure 4: Annual Production Scenarios with 2 Percent Growth Rates and Different resource Levels (DeclineR/P=10)
Figure 5: Supply and Demand Scenarios
Figure 6: Differing Views on Forecast Date of Peak Oil
Figure 7: Total Oil Reserves and Type of Production
Figure 8: World Oil Production by Type in the New Policies Scenario
Figure 9: Pathways for Carbon Neutrality
Figure 10: US Federal requirement for renewable fuels which will be enforced by the EPA
Figure 11: Final energy consumption in transport, by fuel, EU-27 (Mtoe)
Figure 12: World Biodiesel Production and Capacity
Figure 13: EU and Member States Biodiesel Production
Figure 14: Current estimates of Technology Development in Biofuels
Figure 15: Indirect Conversion Synthetic Fuels Manufacturing Processes
Figure 16: Biomass Fractionation
Figure 17: Algae biodiesel manufacture
Figure 18: Thermal, biological and chemical routes to biofuel and chemical production.
Figure 19: Modifications necessary for engines to cope with increasing ethanol/petrol blends.
Figure 20: Basic Process for Manufacturing Biodiesel
Figure 21: Natural Gas Vehicle proliferation worldwide
Figure 22: Fuel Efficiency By Type
Figure 23: WTW Efficiency of Hybrid Electric Vehicles (HEV)
Figure 24: Japanese R&D fuel cell projects
Figure 25: Commercialisation Status of Main BioFuel Technologies

Table 1: Energy and emission trends under the Baseline and Blue Map Scenarios: 2050 compared with 2007

Table 2: Government Drivers of Alternative Fuels

Table 3: List of Viable Alternative Fuels

Table 4: Relative Energy Content of Alternative Fuels

Table 5: Energy Output of Biodiesel compared with other Alternative Fuels

Table 6: AAF usage and trends in the US:

Table 7: EPA definitions of Alternative Fuels

Table 8: Energy consumption statistics from the European Environment Agency (EEA)

Table 9: Bio Fuels Policy in Asia

Table 10: Biodiesel Emissions

Table 11: key R&D issues facing those developing Advanced Biofuels

Table 12: World Ethanol Fuel Production in Million Litres

Table 13: N ExBTL Renewable Diesel (HVO) versus Traditional BioDiesel (FAME)

Table 14: Blending the characteristics of Biofuels