



Introducing BP Biofuels

a growing alternative

Ruth Scotti US Fuels Policy Advisor BP
Governor's Ethanol Coalition Meeting
2nd of October 2006

Biofuels Talk Overview

- Drivers for Change
- Future Fuels Pathway
- Our Current Options and Actions
- Our New Business and Initiatives
- Future Outlook for Biofuels

Drivers for Change



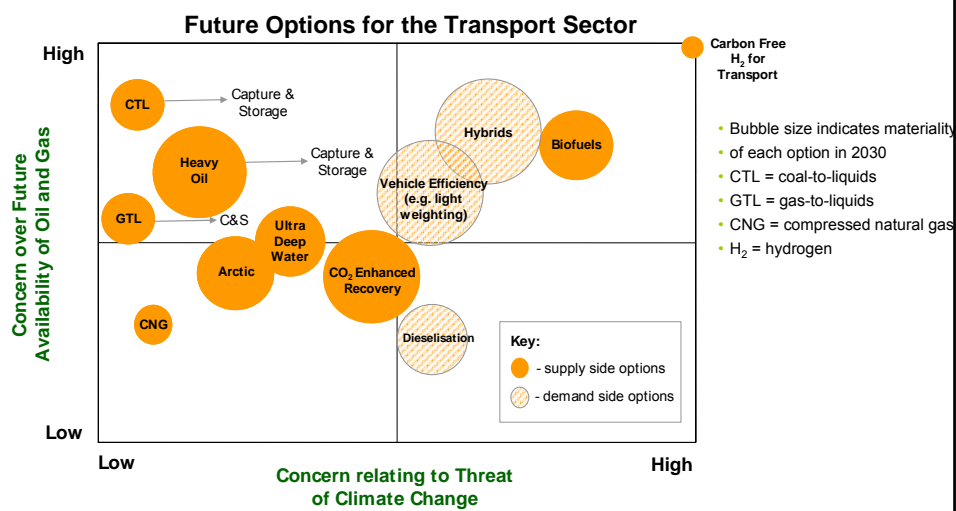
Key drivers in moving towards sustainable mobility solutions

- Security of supply & energy diversification
- Climate change issues
- Biofuels address both these issues.



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Why Biofuels?



Security of Supply and Energy Diversification



- Biofuels will help governments achieve their energy security goals and reduce dependence on imported oil
- Biofuels have the added benefit of helping the agriculture sector

Imported Energy Dependency Profile

Transport	2004	2020
N America	53%	64%
EU	81%	89%
China	47%	72%
India	66%	84%



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Agricultural and Rural Impact



- Extremely large quantity of biomass needed to meet transport energy needs
- Current Availability of Corn
- Need for Dedicated energy crops
- Eventual Change in farming
- Opportunities to utilize low value land and waste



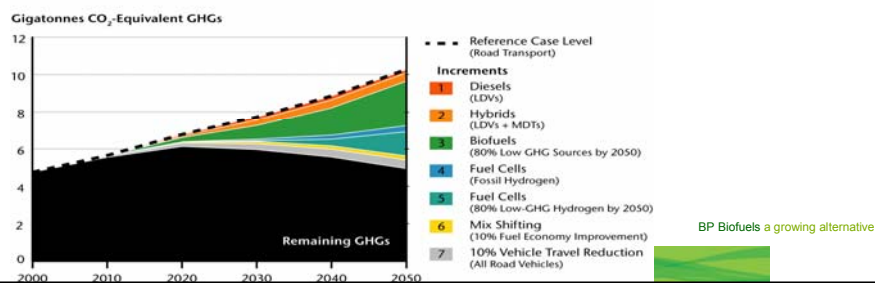
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Greenhouse Gas Emissions Reduction



- Transport energy demand is projected to double by 2050
- Transport comprises 21% of CO₂ emissions
- A variety of technologies can reduce GHG emissions in the future
 - Vehicle efficiency
 - Biofuels and other renewable fuels
 - Demand reduction

Combined Technology Case



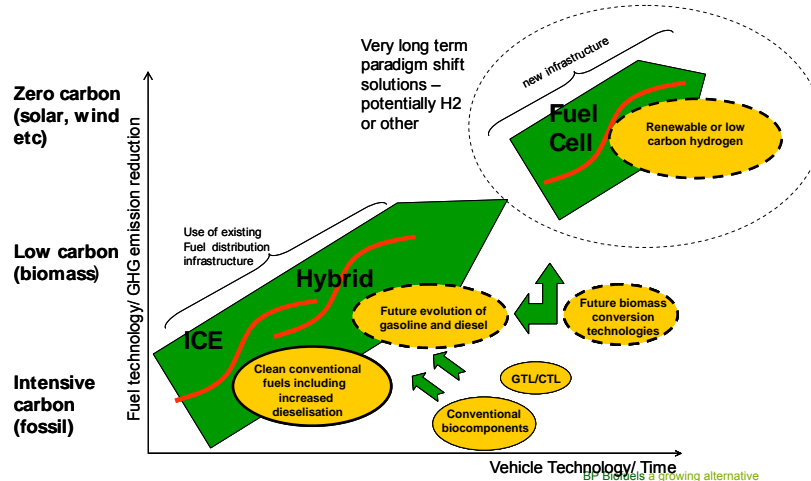
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BP strategy: The Future Fuels Pathway



Biofuels is a critical and timely step in the future fuels pathway and will help deliver goals towards security of supply and GHG emission reduction



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“Conventional” Bio-components



Ethanol for gasoline



Esters for Diesel (FAME)

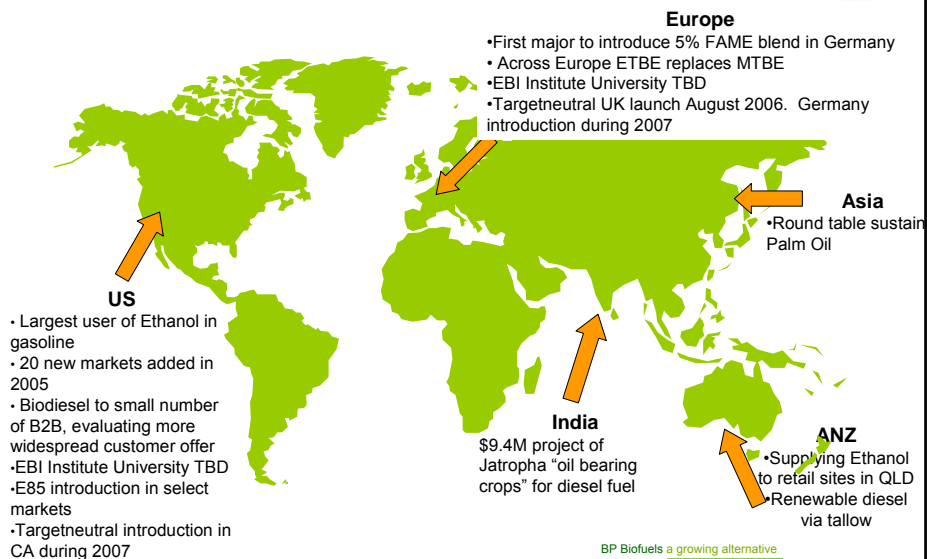
sugar & starch crops

oil crops

- Conventional biofuels are a positive first step in use of biomass
- GHG reductions modest, not all biofuels are equal
- Benefit rural economy
- Limitations :
 - Competing land use issues – food vs power generation
 - Not ideal fuel molecules:
 - handling/quality issues;
 - infrastructural compatibility issues

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BP's Biofuels Activity



Today: Ethanol

Product facts

- Ethanol (E100) emits approx **20% less GHGs than gasoline**. Consequently, E10 delivers approx 2%, and E85 delivers approx 17%

Economics and policy

- Current global ethanol consumption is 8bn gallons – less than 2% of total consumption
- The US government has set a mandate to increase ethanol consumption from 4bn gallons in 2005 to **7.5bn gallons by 2012**
- A **federal tax credit** of \$0.51/gallon is offered for ethanol (E100)
- Increased demand for ethanol (mostly due to phasing out of MTBE) may further **increase ethanol prices** in the short term, particularly on the East Coast
- New ethanol capacity coming on-stream may lead to a **return to price parity**

BP and Ethanol

- BP is one of the **largest purchasers of ethanol** in the US (over 500m gallons in 2005)
- E85 Pilot Planning Underway

Today: E10

- E10 is **mandated** in large cities like NY, Chicago, LA, the state of Minnesota, and several East Coast states
- BP supplies E10 to approx **7,000 BP-branded gas stations** throughout the US
- Opportunity to accelerate roll-out of renewable fuel to a **large portion of the vehicle pool**
- **No need for investment** in gas station or vehicle equipment (only investment needed is blending capacity at terminal level)
- Delivers approximately **2% GHG reduction** vs regular gasoline

Today: E85

- BP Views E85 as a good first step down the road to biofuels becoming more material part of the fuel supply
- Short-Term Constraints
 - Limited availability/ recent high price of ethanol
 - Preferred to direct ethanol into mandated markets (E10)
- Our Policies on E85
 - We allow our independent marketers to place it under the BP branded canopy as an unbranded product provided it meets all requirements and standards for safe dispensing
 - Branded Pilot in Planning Process

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BP's New Biofuels Business



- Formed a new Biofuels business in June
- Announced plans to invest \$500 M in new Energy Biosciences Institute to provide a pipeline of biofuels technology for the business
- Will partner with science company DuPont to develop advanced biofuels-the first introduction is bio-butanol.
- BP & DuPont collaborating with British Sugar on introduction of bio-butanol into UK
- Launched targetneutral in the UK as a consumer education, non-profit programme that gives motorists the chance to 'neutralise' the CO₂ emissions from their driving



DU PONT



targetneutral

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Strategic Focus: Next Generation Biofuels



- Focus on commercializing technologies from feedstock through to fuel
- Advanced biofuels respond to all drivers - deliver on GHG, security of supply & support agriculture sector
- Next generations biofuels will benefit from enhancing the performance of current biofuels
- Able to compete with petrochemical based fuels on an unsubsidized basis
- Second generation biofuels are expected to be even less carbon intensive because they will be manufactured using non-food crops (lignocellulosic) and with a different processing technology

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A New Option



biobutanol



- Biobutanol has a number of attractive properties:
 - Made from all the same feedstocks as ethanol (Corn or future – switchgrass)
 - Easily blended into gasoline
 - Can use existing fuel infrastructure (pumps and tanks) without major modification
 - Potential to be used at higher blend concentrations in unmodified vehicles
 - An energy content closer to that of gasoline than ethanol – reducing the impact on fuel economy for the consumer
- Biobutanol is complementary to ethanol:
 - Can be used together with ethanol
 - It can enhance the performance of ethanol blends in gasoline

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Over time, the direction of the biofuels industry will ultimately be shaped by many factors



- Supply increasing rapidly; but government policy changes could lift demand further
- Reliable and low cost feedstock supplies will be critical to low cost production
- Feedstock supply may limit market growth until new technologies become available
- Delivering fuel performance characteristics that are valued by consumers
- The development of responsible legislation



Conversion Capacity



Low Cost Production



Technology Development



Customer Preferences



Legislative Framework

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Regulation: Target ends, not means. Allow markets to pick winners. Encourage sustainable practice.



- Maintain flexibility – avoid fuel-specific targets
- Regulatory mechanisms to apply equally across a market and market participants
- Incentive or obligations based on emission reduction or energy content rather than volume basis
- Source from sustainable and responsible production routes
- Maintain fungibility of the slate
- Avoid fixed per-gallon mandates

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Current Issue: Sustainability Considerations



Currently formulating Sourcing Guidelines to define parameters for social and environmental responsibility

- GHG Certification
 - Not all biofuels equal on GHG basis
 - Methodology to quantify supply chains in process of development
- Feedstock Sourcing
 - Environmental Issues
 - Deforestation/Land use issues
 - RSPO an example of environmental sustainability standard
 - Social and Ethical
 - Working conditions in emerging markets
 - Moving indigenous populations
 - Child labor

Key Challenges for Biofuels

Challenge	Description
1 Poor fuel quality of bio-molecules	<ul style="list-style-type: none"> - Lower energy content than gasoline (poor mileage) - Problematic when mixed with water (e.g., in pipelines) - Can only blend up to c. 10% with gasoline without engine modification - Reid Vapor Pressure in low level blends is high
2 Scarcity of feedstock	<ul style="list-style-type: none"> - Feedstock is key driver of biofuels production cost (60-80% of total cost for ethanol and biodiesel) - Access to low cost feedstock with therefore be a key source of advantage – and supplies are limited - US has enough corn to supply 7.5bn gallons RFS requirement – but not enough for overall 10% blend
3 High cost of biofuels compared to gasoline	<ul style="list-style-type: none"> - At \$40/bbl oil, gasoline value is \$1.08/gall; ethanol production cost is \$1.20/gall (US) or \$1.70/gall (EU) - Biofuels only rendered profitable by government policy (outside Brazil) e.g., \$0.51 incentive (US); \$1.40/gall (UK)

Biofuels – Summary



- Climate change and energy supply diversification will continue to underpin increased use of biofuels
- Conventional biofuels are a positive first step in use of biomass
 - GHG reductions modest, not all biofuels are equal
 - Land use and competition for food crops are serious issues
- Standards are needed for carbon certification of biofuels and to ensure sustainable biomass production
- BP is working in partnerships to develop processes for production of second generation biofuels
- If Biofuels are to make a significant impact of the two key drivers of energy supply security and climate change, then in the longer term, we will need:
 - Better feedstocks
 - Better processes
 - Better fuel molecules

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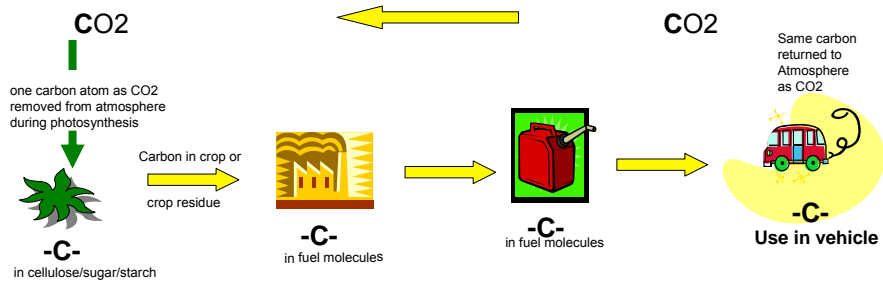
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Backup slides



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Biofuels Overview - the carbon cycle



Fossil Energy Inputs

Biomass growth



External energy and associated GHG emissions for farming (eg from fertiliser use)

+

Processing to produce biofuel



External energy and emissions for fuel production process

+

Biofuel

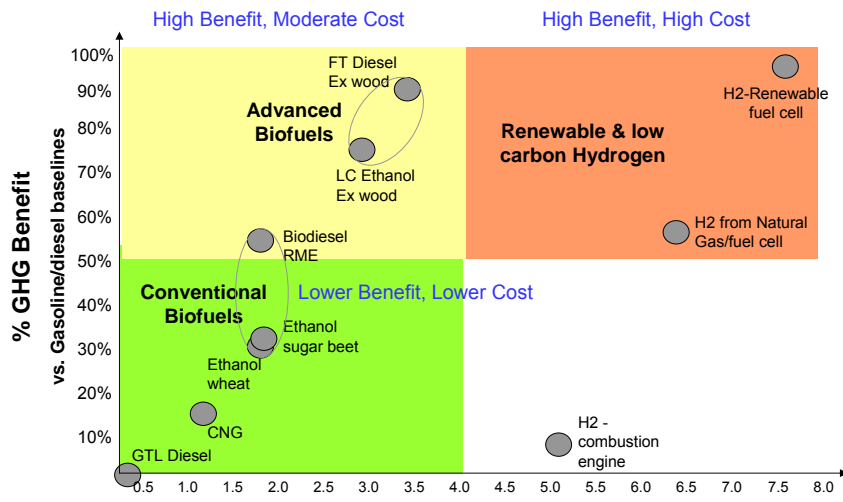


External energy for distribution & transportation

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WTW GHG emission result for biomass pathways. Contribution from above closed cycle is zero

WTW GHG benefit vs cost



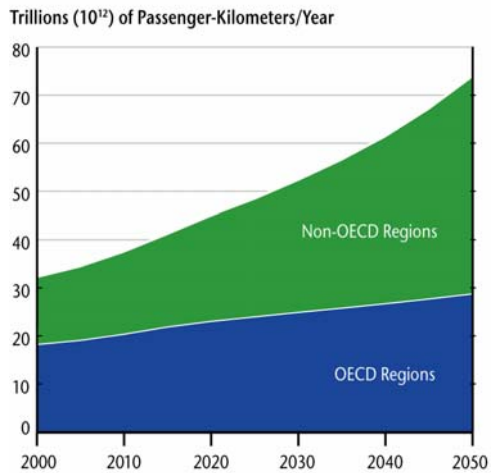
Reference-WTW Analysis of Future Automotive Fuels & Powertrains in the European Context-Version 2a, December 2005. Concawe/European Council for Automotive R&D /European Commission Joint Research Centre

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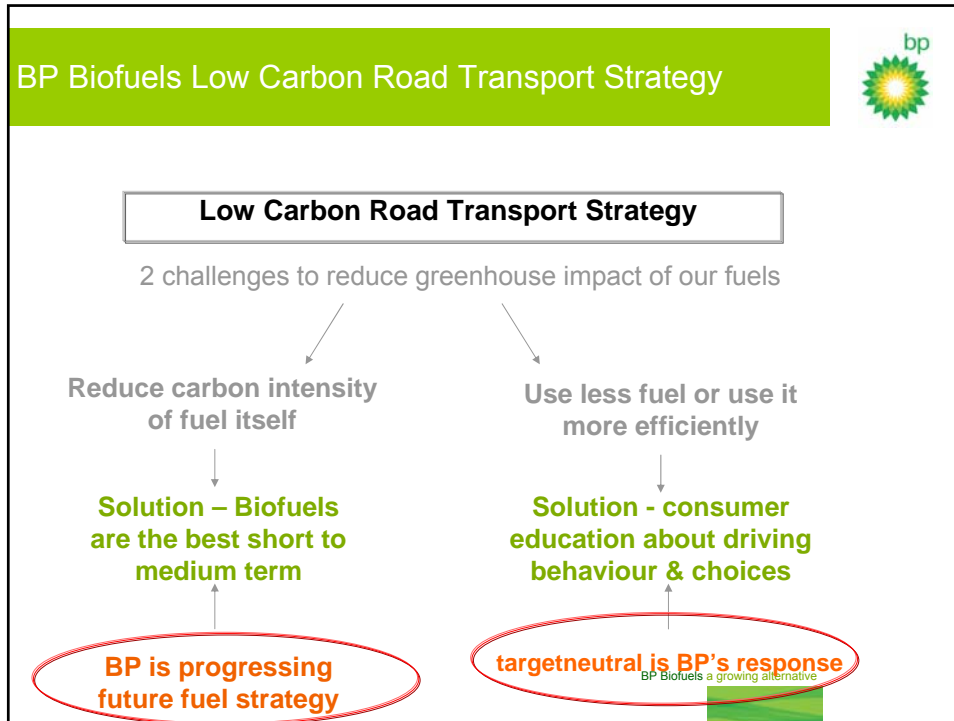
Demand of transport



Personal transport activity



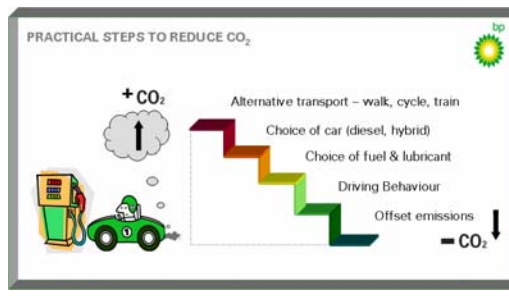
BP Biofuels Low Carbon Road Transport Strategy



What is targetneutral?



- **targetneutral** is a voluntary, non-profit programme that gives motorists the chance to 'neutralise' the CO₂ emissions from their driving
- **Reduce, Replace, Neutralise**
 - Reduce means changing attitudes and behaviours to reduce fuel usage.
 - Replace means buying a product that is more energy efficient.
 - Neutralise means becoming CO₂ neutral for those emissions you cannot prevent now.
- Managed by biofuels business



How does it work?



• Consumer visits www.targetneutral.com calculates their annual CO₂ emissions (miles & mpg) & pays to purchase equivalent emission reductions to 'neutralise' CO₂ impact

• Average payment is approx £20pp pa

• 100% of consumer funds (Excl VAT & transaction fees) goes to emission reduction projects in developing countries

• BP will make a contribution when members refuel at BP sites (up to £0.10 per tank regular & £0.20 Ultimate)

• Members & retail value tracked via Nectar cards

• Quarterly email communication to members

• BP's UK fuel tankers are CO₂ neutral



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Where does the money go?



Portfolio of developing country projects to reduce CO₂ emissions

- Renewable energy & biomass projects preferred by consumers
- Sustainability & community benefits
- Independently verified – real & quantifiable
- Credits retired upon purchase

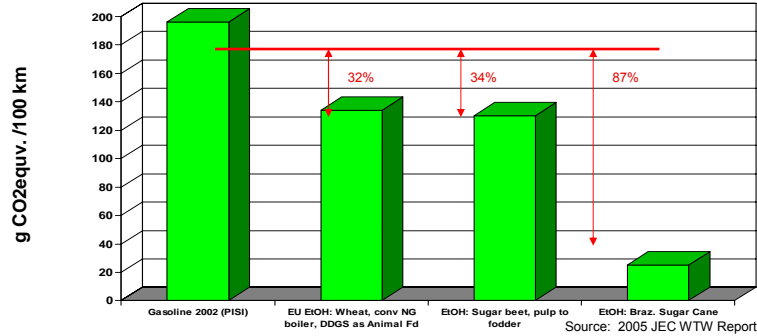
To help counter cynicism, an independent panel of leading environmentalists, academics and opinion formers, chaired by Jonathon Porritt, has been established to oversee & monitor the scheme



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Butanol Well to Wheels: Similar to Ethanol

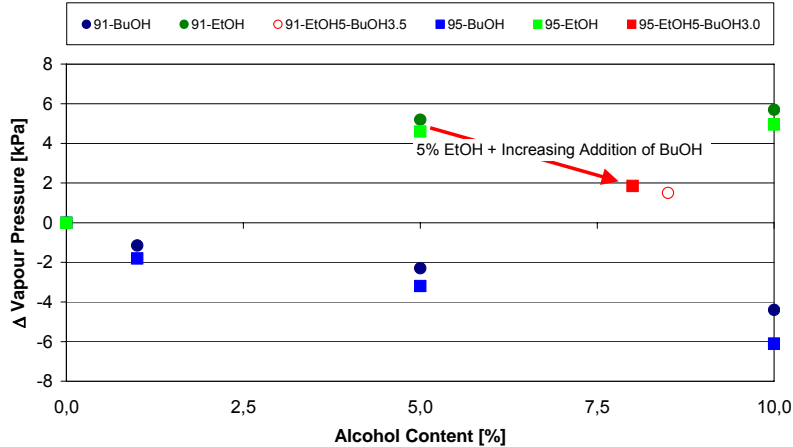
- DuPont and BP are currently in the process of carrying out detailed calculations of biobutanol's GHG WtW emission performance. Initial indications are that, on the same feedstock basis, biobutanol can deliver emission reductions that are similar to ethanol on the same feedstock basis.



Butanol: Impact on Vapor Pressure

Butanol has a vapour pressure synergy with ethanol. Butanol's DVPE in a co-blend with ethanol is negative. In this example ~ minus 35kPa.

Impact of Alcohol Content on Vapour Pressure



Butanol: Water Solubility

Butanol does not phase-separate in the presence of water, unlike ethanol

