

# Biofuels and oil: More than just competitors

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All modern fuels have the same origin: the sun, a gigantic nuclear fusion reactor that provides our planet with an amount of energy equivalent to around 28 million barrels of oil a second. Coal, oil and natural gas preserve the solar energy accumulated by living creatures hundreds of millions of years ago, concentrated and stored deep underground. We can nowadays recover it, wherever we are. More recent photosynthetic processes have led to the development of biofuels which only a few months before had been mere carbon gas in the atmosphere, water and sunlight falling on the leaves of vegetables.

Conventional fuels and automotive biofuels such as ethanol and biodiesel are similar in other ways: they share basically the same logistics chains and are used in engines that are essentially the same, especially when mixed with other fuels, as is frequently the case. Indeed, nowadays in many countries it is practically impossible for motorists to tell whether they are using pure conventional fuel, derived from oil, or one mixed with biofuel, currently sold in gasoline stations in more than 60 countries.

Bioenergy was the first form of energy consumed by humankind in the bonfires that illuminated pre-historic caves, and it remained our main energy resource for many centuries. It was only with the advent of the industrial revolution that wood began to give way first of all to coal and later to oil and natural gas, resources that currently account for 80 per cent of the global energy consumption, while biomass energy contributes approximately 10 per cent of this consumption, mainly as firewood in developing countries.

When the automobile industry appeared, some of the first fuels used by its pioneers included peanut oil, adopted by Rudolph Diesel in his engine, and corn ethanol enthusiastically championed by Henry Ford. With the increase in oil production and improvements in refining technology in sync with the evolution of engines, gasoline, diesel fuel and subsequently also aviation kerosene almost completely prevailed in the important markets of passenger and freight transport fuels. Brazil was one of the few places where biofuels remained in regular use. As the country did not produce oil locally, since 1931 mixing ethanol with all the gasoline consumed was mandatory. It was initially at a level of 5 per cent (E5), rising to 25 per cent (E25) with the oil shocks of the 1970s, and subsequently

consolidated with pure ethanol (E100) in flex-fuel vehicles that nowadays comprise most of the Brazilian vehicle fleet.

In recent decades production and use of biofuels have been stimulated in various countries. Depending on the available resource base and with the aim of fulfilling objectives linked to the environment (through the reduction of local greenhouse gas emissions), energy supply security and the development of agro-industry, countries have fostered biofuel programmes usually to produce ethanol/gasoline and biodiesel/diesel mixtures. It is estimated that liquid biofuels currently account for 2.4 per cent of the world consumption of energy in the transportation sector, which is equivalent to around one million barrels of oil a day – 90 per cent as ethanol and 10 per cent as biodiesel. A growing number of countries – currently around 60 – are establishing mandatory norms and mixture targets, most notably in the US, the European Union, China and of course Brazil.

## Prospects and potential

Various studies show that the biofuels market will grow significantly in the coming years. BP estimates that biofuels may account for 5 per cent of transportation energy consumption in 2030. In the same year the International Energy Agency expects that, if renewable energy is stimulated, 7 per cent of the auto fuel market will be supplied by biofuels. Indeed, the production of biofuels is growing faster than the production of conventional oil.

All conditions are in place for this expansion. Even with this significant increase in production, the share of biofuels in agricultural production will continue to be relatively small. The net requirement of arable land for the production of biofuels will increase from 14 million hectares in 2004 (1 per cent of the world is cultivated land) to 53 million hectares in 2030 (3.8 per cent of land used for agriculture), according to the IEA, depending largely on the mix of raw materials that will be used, and also on the technologies adopted. For example, with only a small improvement in cattle-raising methods, large areas of low-quality pasture could be made available for crops without affecting food production. This is the case in Brazil where, during the past 35 years, areas devoted to pasture have fallen by 8 per cent while the cattle herd has increased by



155 per cent, substantially expanding beef production.

Indeed, recent studies have shown that, in many cases, the production of biofuels increases food security. In addition, they contribute to environmental preservation by absorbing carbon dioxide during the plant-growing process; they contribute as well to the economy by mitigating the impact of oil product imports on the trade balance and to social progress by increasing the number of years of schooling, reducing illiteracy and the number of child workers employed, as well as by keeping more people in the countryside.

In addition to liquid automotive fuels, other bioenergy sources, such as bioelectricity and biogas have grown and become increasingly competitive. Currently, more than 9GW of thermal plant output is totally based on sugarcane waste in Brazil and around 6,000 biogas digestors are producing and injecting biogas into natural gas pipelines in Germany. The new technologies are maturing fast and their prospects are good. A case in point is the enzymatic hydrolysis of lignocellulose (a second generation biofuel), with its first commercial plants beginning to operate in Europe, the US and Brazil. Another promising area is aviation biofuels, which is being strongly supported by the aerospace industry and airlines. There are already regular weekly intercontinental flights on aircraft that run on a mixture of conventional aviation fuel and biofuels.

Biofuels can be used to advantage as a high-quality component to specific products in the oil industry, and in many cases they are highly competitive. For example, ethanol is an octane booster and biodiesel can be used as a lubricity additive in ultra-low sulphur diesel.

This context represents an important “win-win” opportunity for the oil industry. Indeed, some on-going joint projects show how cooperation between oil and biofuels can be viable and constructive. In Brazil, in 2008, Petrobras created a subsidiary focusing on the production of ethanol and biodiesel with the aim of becoming one of the main players in this market. The company sees biofuels as a business opportunity in the export area, taking advantage of its presence, visibility and track record in handling ethanol and as an eventual offset to any future loss in

market share in conventional fuels. BP has also been operating ethanol plants since 2008. In 2011 Shell and Cosan joined forces to create Raízen, currently Brazil’s leading ethanol producer. In Finland, Neste Oil became world leader in the supply of biodiesel.

More than competitors, the oil and biofuels industries should increasingly be seen as partners. Biofuels producers depend on oil companies as off-takers and logistics operators. It would be difficult to promote biofuels without them. Biofuels and oil can both share and develop the same transportation markets, improving the quality of products and enhancing the energy sector’s overall sustainability.

Fantastic volumes of liquid fuels are consumed daily. The share of oil products in the global energy mix has fallen by six percentage points during the last 35 years. Thus, the opportunity for biofuels has become real and clear. It is difficult to establish a single path towards sustainable mobility during the next decade. All options are necessary. Oil has found it difficult to meet total demand, while well-managed biofuel reserves are eternal.

These and other aspects were debated at the International Biofuels Seminar, an event promoted by IBP – the Brazilian Petroleum, Gas and Biofuels Institute and WPC – the World Petroleum Council, which took place on March 17-18 this year in São Paulo, Brazil, and was attended by 140 professionals in the sector. The seminar’s main conclusions will be presented at a special session of the 21st World Petroleum Congress in Moscow. ■

***Biofuels could account for 5% of transportation energy consumption by 2030***

