

## Road Transport Fuels in Europe: the Explosion of Demand for Diesel Fuel

*In the last 20 years, road transport fuel consumption has more than doubled in European countries, due to strong growth on the diesel passenger car segment and in the transport of road freight. In an economy heavily dependent on oil, European authorities are seeking to promote alternative energy solutions, such as motor fuels produced from biomass.*

### Consumption of Road Transport Fuel in Europe

In 1985, Western Europe consumed 180 Mt of road transport fuel, with gasoline representing 60% and diesel fuel 40%.

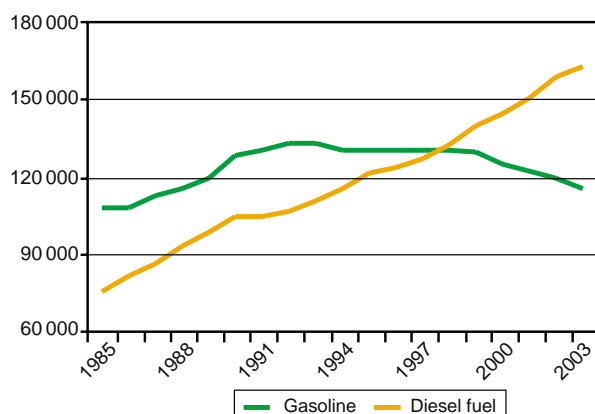
In 2004, total consumption exceeded 270 Mt, an increase of nearly 50% in twenty years, and the breakdown was reversed: diesel accounted for 60% and gasoline 40%.

While gasoline demand rose by 7% (up by 1.4%/year between 1985 and 1998, then down by 2.3%/year in the last 5 years), the consumption of diesel fuel for road transport more than doubled (+4.4%/year) during the period 1985-2003, for two reasons:

- strong penetration on Europe's diesel passenger car market;
- high growth in truck freight traffic.

As a result, EU refinery production saw the development of a gasoline surplus (30 Mt in 2003) while the middle distillates (diesel fuel/heating fuel) remained more or less stable over the last five years.

Fig. 1 Consumption of road transport fuel in Europe<sup>(1)</sup> (kt)



(1) E.U. + Switzerland + Norway + Turkey + Island.

Source: CPDP

IFP/Economics Studies/2004

Based on its 2001 forecasts, the European Commission expects road transport fuel consumption to reach 325 Mt by

2020. There should be significant differences with the period 1985-2000: demand for gasoline should rally slightly (+0.6%/year) and demand for diesel fuel should grow at a substantially lower rate (+1.1%/year).

These figures are based on an assumption of major shifts, as yet barely perceptible, in diesel penetration and freight transport trends.

### Strong Diesel Penetration on the Passenger Car Market

One of the specificities of the European passenger car market is the considerable extent to which diesel vehicles have penetrated. The evolution of this trend, which began in the mid-1980s, differed from country to country for several reasons. For one thing, the taxation of motor fuels and motor vehicles varies greatly. In addition, it is affected by different perceptions about the environmental performance of diesel technology.

In the 1990s, the percentage of diesel passenger cars nearly doubled, up from 14% in 1990 to 32% in 2000; subsequently, it has continued to rise at a strong pace.

**The comeback of diesel vehicles in Europe is due to technological advances and more specifically to the success of such innovations as common rail direct injection technology and the particulate filter.** Efforts by European manufacturers to limit the polluting effects of the diesel engine and improve its performance boosted market penetration from 32% in 2000 to 46% in 2004. Growth is also supported by the fact that diesel engines are available on all market segments (although to a lesser extent on A-Class vehicles), perform as well as the spark ignition engine and obtain lower specific consumption levels.

On the French market, for instance, 46-47% of all passenger cars sold in 1994-1995 were diesel vehicles, a record high. The continued price difference between gasoline and diesel fuel and favorable tax conditions (tax disc, vehicle registration card) were responsible. In 1996-1998, the rate

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dropped to about 40% as the result of a campaign against diesel pollution and the possibility of that tax advantages would be withdrawn. In 2000-2004, the diesel segment saw market share rise from 50 to 70%, because PSA Peugeot Citroën — a big innovator on this particular segment — added vehicles equipped with particulate filters to its range.

As for recent trends in other European countries:

- **Spain:** The market has been booming, up from 16.6% in 1992 to over 60% in 2004.
- **Italy:** After the elimination of the “Super Bollo” (tax disc for diesel vehicles), sales of diesel-powered passenger cars started growing again (an increase of 22% / 22% of the market in 1998). They represented 34% of the market in 2000 and over 50% in 2004.
- **Germany:** While remaining stable at about 16-17% during the 1990s, the trend turned up in the early 2000s. By 2004, diesel penetration exceeded 40%.

**Growth on the diesel passenger car segment** has led to gradual diesel penetration of the passenger car fleet in key EU countries. Diesel penetration of the European fleet rose from about 12% in 1995 to 22% in 2003. This increase was especially pronounced in France (up from 16% to 40%) and Spain (10 to 30%). By way of an indication, the EU totaled 190 million passenger cars in 2003. It also numbered 20 million light-duty vehicles (< 3.5 t) in 2003, nearly 60% of which had diesel engines.

The development of diesel-powered passenger cars in Europe reflects the effort by European manufacturers to ensure that their entire range meets CO<sub>2</sub> emissions targets (140 g CO<sub>2</sub>/km in 2008). In the short term, however, it will probably be difficult to reach this goal, because vehicles are increasingly

heavy and include options such as air conditioning that lead to excess fuel consumption.

According to the latest EU prospective survey, “European Energy and Transport Trends to 2030” (January 2003), total consumption for passenger cars in the EU should remain relatively stable between now and 2030.

## The Development of Road Freight Transport

There is another reason why diesel consumption is booming in Europe: road freight transport in the EU virtually doubled (from 800 billion to 1500 billion tonnes/km) between 1990 and 2004. On the heavy vehicle segment, total diesel fuel consumption shows a comparable trend for 1990-2004. In the early 2000s, trucks represented over two-thirds of the consumption of road transport diesel fuel in Europe.

The upsurge in road freight transport coincides with the evolution of the European economy from an inventory economy to a flow economy in the last 20 years. This has accelerated as industrial production, especially of labor-intensive goods, is relocated to the countries offering the lowest production costs, even if they are remote from the consumer markets. Finally, the elimination of borders in the EU and its enlargement should intensify the road transport boom in the absence of economical alternative solutions. The only way to obtain a lasting reversal of this trend would be to reorganize European freight flows and invest in infrastructure (e.g. combined rail-route infrastructure), which would require very high levels of capital expenditure.

According to the European Union survey, truck consumption will increase by nearly 80% and road freight traffic by 2.4%/year between now and 2030.

Fig. 2

Diesel penetration on European markets

	(% of passenger car registrations)								
	1985	1990	1995	1999	2000	2001	2002	2003	2004 (f)
France	15	33	46.5	44.1	49	56.2	63.2	67.4	70
Germany	22.1	9.8	14.6	22.4	30.3	34.5	37.9	39.9	43
Italy	25.1	7.8	10.3	29.4	33.6	36.5	43.5	48.7	51
Spain	21.7	14.2	33	50.6	53.1	52.5	57.3	60.9	62
United Kingdom	3.6	6.4	20.2	13.8	14.1	17.8	23.5	27.3	29
Europe (17 countries)	15.6	13.9	22.1	28.4	32.1	36	40.3	43.7	46

(f): forecast

Source: CCFA

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Fig. 3

1996-2009: Motor fuel quality standards (Europe)

Product quality in Europe				
Gasoline	1996	2000	2005	2009
Sulfur max.	500 ppm	150 ppm	50 ppm (10)	10 ppm
Benzene max.	5%	1%	1%	?
Aromatics max.	nd	42%	35%	?
Olefins max.	nd	18%	18%	?
Diesel fuel	1996	2000	2005	2009
Sulfur max.	500 ppm	350 ppm	50 ppm (10)	10 ppm
Cetane number min.	49	51	51	?
Polyaromatics	nd	11%	11%	?
Specific gravity max.	860	845	845	?

Source : IFP

IFP/Economics Studies/2004

## Motor Fuel Specifications

As regards policy, European public authorities have consistently aimed to reduce the polluting emissions of road transport vehicles (carbon monoxide, unburned hydrocarbons and now nitrogen oxides and particulate matter). That is why increasingly stringent motor fuel standards have been implemented.

The most recent example: the sulfur content must be reduced to 50 ppm by 2005 and to 10 ppm by 2009. In a report to be published in 2005, the European Commission is expected to clarify whether motor fuels will be subjected to tighter regulation in other areas (e.g. aromatics and/or polyaromatics concentrations).

## Replacement Fuels

In the face of strong growth in passenger and freight transport, the European Union is attempting to promote alternative motor fuels, especially biofuels.

In a green paper entitled "Towards a European strategy for the security of energy supply", the Commission set an objective: replace 20% of conventional motor fuels with replacement fuels (biofuels, natural gas and hydrogen fuels) by 2020.

In Europe, biofuels have been incorporated in motor fuels since the early 1980s. The 1987 directive on oxygenated compounds permitted the addition of ethanol (up to 5%) or ETBE (up to 15%) to gasoline. More recently, the use of

vegetable oil methyl esters (VOME) was authorized: up to 5% VOME in diesel fuel for standard distribution in France.

Table 1  
The European Commission targets for alternative motor fuels  
(% of total road fuels)

	2000	2005	2010	2020
Biofuels		2%	6%	8%
Natural gas			2%	10%
Hydrogen				5%
Total, alternative motor fuels	0%	2%	8%	23%

Source: European Commission

IFP/Economics Studies/2004

*The use of natural gas* implies new distribution infrastructure and the modification of motor vehicles. It is improbable that existing vehicles will be modified on a large scale; this replacement fuel could be gradually introduced by commercializing new, dedicated vehicles. In Europe, the development of this market has remained very limited, mainly confined to captive fleets (bus fleets, etc.) with their own refueling stations.

*As for hydrogen*, the constraints relative to cost, production and on-board storage are such that its development can only promise a solution in the very long term. The main options is the use by a fuel cell to supply an electric vehicle; this system offers an alternative to direct storage of electricity.

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