

Refining and Petrochemicals

In 2003, refining margins showed a clear improvement that continued throughout the first three quarters of 2004. Oil companies posted significantly higher earnings in 2003 compared to 2002, with the results of first quarter 2004 confirming this trend. Due to higher feedstock prices, the implementation of new capacity and more intense competition, the petrochemicals industry was not able to boost margins in 2003. In such difficult business conditions, aggravated by soaring crude prices, the petrochemicals industry is not likely to see any improvement in profitability before the second half of 2004.

Business Environment

In 2003, the global economy expanded by 3.9% (+0.9%), confirming a rally that started in 2003. For 2004, the IMF is expecting sustained growth (5.0%). However, growth continues to be unevenly distributed, located mainly in the United States and developing countries, especially China. Economic activity in the United States was sustained by a rising budget deficit and depreciating dollar, among other factors. Emerging from its slump of 2002 and 2003, the euro-zone economy was not able to narrow the growth gap with the United States. In 2004, the U.S. should expand at a rate of 4.3% versus 2.2% for Europe.

Table 1
Growth of GDP in terms of volume (variations as a %)

	2001	2002	2003	2004 (e)	2005 (e)
World	2.4	3.0	3.9	5.0	4.3
United States	0.3	2.2	3.0	4.3	3.5
European Union	1.5	0.8	0.5	2.2	2.2
China	7.5	8.3	9.1	9.0	7.5

Source: IMF

(e): estimate

Prospects for the world economy in 2005 continue to look brighter (+4.3%). Growth should descend to 3.5% in the United States, however, while the euro-zone remains constant at 2.2%, without narrowing the gap with the U.S. China is expected to report continued high growth of about 7.5%. But a number of factors could inhibit world growth: uncertainties about the future of Iraq and about how quickly producing countries can boost production, not to mention continued high oil prices.

Refining

Overall Trends

In a rallying economy, world demand for petroleum products rose substantially in 2003 (+1.8 Mbbbl/day). According to

estimates for 2004, which are constantly being revised upwards, demand should reach 82.4 Mbbbl/day, up 2.7 Mbbbl/day over 2003. This is a large number compared to the increases posted for 2001 and 2002: 0.6 and 0.7 Mbbbl/day, respectively. Driven by high growth rates, the United States and Asia (especially China) accounted for about two-thirds of the increase in world oil demand. 2004 will see China become the world's second largest consumer of crude.

The share of OPEC countries in world production stabilized at about 33.7% in 2003, following a three-year decline. In the first half of 2004, this share reached 34%, corresponding to an increase in OPEC oil production of 1.5 Mbbbl/day compared to the same period of 2003.

Table 2
Petroleum products: world demand, supply and stock variations (in Mbbbl/day)

	2001	2002	2003	2004 (e)	2005 (e)
World demand	77.3	77.9	79.7	82.4	83.9
Variation [n - (n-1)]	+0.7	+0.6	+1.8	+2.7	+1.5
World supply	77.2	76.9	79.6	-	-
Variation [n - (n-1)]	+0.3	-0.3	+2.7	-	-
Stock variations	-0.2	-1.0	0.0	-	-

Source: Oil Market Report (IEA)

(e): estimate

The increase in crude production did not suffice to cover the large rise in oil demand. Stocks fell, nearing their minimum operating level.

In 2003, world refining capacity rose slightly by 0.4 Mbbbl/day to reach 83.7 Mbbbl/day. The refinery utilization rate stood at 92.7%, up 1.5% over 2002. Due to sustained demand, it should stay at least that high in 2004.

Particularly in the United States, refineries are being used at close to maximum capacity, encouraged by high gasoline prices and a tight supply situation. Due to the large number of grades required and to the imposition of increasingly stringent formulation constraints (the MTBE ban), this

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situation should last, because refiners will have a hard time getting around these bottlenecks.

Crude and Petroleum Product Prices

After remaining stable in the US\$28-32/bbl range throughout the second half of 2003, crude prices reached unprecedented highs in 2004. In October 2004, the price per barrel of WTI in New York exceeded US\$55/bbl and the Brent price in London US\$50/bbl.

Refining Margins

In 2003, refining margins had shown clear improvement over 2002. In the first half of 2004, they attained very high levels in different parts of the world, supported by:

- strong gasoline demand in the United States, driven by high economic growth. In addition, its limited refining capacity must adapt to new motor fuel specifications;
- a substantial rise in Chinese motor fuel demand. China now absorbs its entire refinery output and has started to import gasoline.

Margins peaked at about US\$5.5/bbl (June 2004) in the United States and Europe, and at US\$5.0/bbl (February) in Asia.

Mergers and Corporate Earnings

In 2003, the theater of operations for corporate mergers and acquisitions shifted from Russia, whose oil and gas production potential was very high, to the new operators of central Europe. Russian operations experienced a net slowdown after the Yukos-Sibneft merger fell through, with uncertainty surrounding the future of Yukos and Russia's situation. In 2004, the countries of Eastern Europe took center stage when the Polish oil company PKN Orlen acquired 63% of the Czech oil and chemicals group Unipetrol. This market has not stabilized yet, however. PKN Orlen and MOL of Hungary may be looking to negotiate a merger. Other companies remain to be privatized, following in the footsteps of Romania's national company, Petrom, taken over by the Austrian OeMV.

With refining margins up substantially in 2003, the oil majors reported refining-distribution earnings that were much higher than in 2002, as shown in Table 4.

Table 3
Complex refining margins (annual average in US\$/bbl)

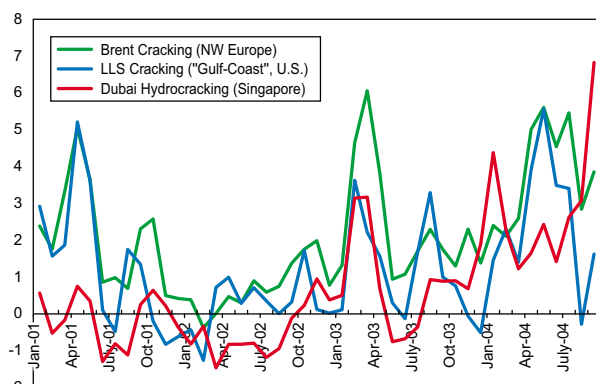
	1996	1997	1998	1999	2000	2001	2002	2003	2004 (e)**
Brent-Cracking (NW Europe)	1.44	1.72	1.58	0.70	3.37	2.05	0.75	2.34	3.82
LLS* cracking ("Gulf Coast" U.S.)	0.07	0.48	0.50	-0.32	1.29	1.36	0.31	1.13	2.88
Dubai-Hydrocrack. (Singapore)	2.46	1.50	0.14	-0.66	0.89	-0.20	-0.56	0.81	2.54

* Louisiana Light Sulfur.

** Averages for the first 9 months of the year.

Source: Oil Market Report (IEA)

Fig. 1 Variations in complex refining margins (in US\$/bbl)



Source: Oil Market Report (AIE)

Table 4
Net earnings reported by refining-distribution companies (in M\$)

	2002	2003	Variations
Total	678	1648	x 2.4
BP	2090	3687	x 1.8
ENI	304	659	x 2.2
Repsol-YPF	809	1350	x 1.7
Shell	1625	3145	x 1.9
Statoil	206	502	x 2.4
Chevron-Texaco	-367	1167	/
Conoco/Phillips	143	1272	x 8.9
ExxonMobil	1300	3516	x 2.7

Source: Annual reports and BIP. Figures published in euros were converted to US\$ based on average exchange rates for the periods concerned. (2002: €1 = \$0.947) (2003: €1 = \$1.129).

For the first half-year 2004, the results posted by American and European majors still looked good, the biggest reason being that margins continued to improve during the period.

Capital Spending in the Refining Industry

In 2003, with margins rising, capital expenditure in the refining sector grew by a moderate 2.4% compared to 2002, while refining capacity only increased by 0.5%. Spending was sustained by the market launch of various high-performance technological innovations (e.g. more efficient catalysts) to improve product quality, with hopes of productivity gains. Current forecasts say that spending will not grow in 2004, continuing the trend of previous years.

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However, as demand for petroleum products expands and excess refining capacity is exploited, industrialists may invest in the years to come, on the strength of higher margins. Projects for new refineries are under consideration in Vietnam, Canada, China, Mexico and even the United States.

At the same time, spending on catalysts (about \$3 billion) and chemicals continued to rise in 2003 (+6%). Purpose: improve the quality of products and bring them in line with prospective standards, whose primary aim is to reduce the sulfur content.

Table 5
Capital spending in the refining industry worldwide (in G\$)

	2001	2002	2003	2004 (e)
Capital expenditure	16.4	16.6	17.0	17.0
Maintenance*	17.0	17.7	18.5	19.1
Catalysts and chemicals	11.3	11.7	12.4	12.8
Total	44.7	46.0	47.9	48.9

* 40% on equipment, 60% on labor and services.

Source: IFP based on data from HPI Market Data

(e): estimate

In the refining business, maintenance spending is a major expense item. In 2003, it grew substantially (+3.2%), proof

that the industry needs to boost the competitiveness and reliability of production plant.

Similarly, spending on maintenance and catalysts/chemicals should register very satisfactory rates of growth: +4.5% and +6.0%, respectively. In Europe and the United States, refineries must be adapted to produce motor fuels in line with new specifications, reduce polluting emissions and boost productivity. This should support growth.

Besides reducing the sulfur content to 10 ppm by 2009, the European Commission is expected to issue a report by year-end 2005 concerning possible orientations for motor fuel regulations (cetane, polyaromatics content, etc.); these orientations will depend on the air quality targets established.

Motor Fuels and Standards

For the next few years, the prime objective remains unchanged: eliminate sulfur. In 2004, Europe did not make any major amendments to Directive 98/70/EC (motor fuel quality) or Directive 1999/32/EC (fuel oils and heating oils).

Marine engine oil and diesel products are governed by Appendix VI of the Marpol Convention (international convention for the prevention of pollution from ships), where it is stipulated that, effective May 20, 2005, the sulfur content

Table 6
Quality of products in Europe

Gasoline	1998	Jan. 00	Jan. 03	Jan. 05	Jan. 08
Sulfur (max.)	500 ppm	150 ppm	–	50 ppm*	10 ppm
Benzene (%vol.)	5% max.	1% max.	–	1% max.	**
Aromatics (%vol.)	–	42% max.	–	35% max.	**
Olefins (%vol.)	–	18% max.	–	18% max.	**
Oxygen (%m)	2.5-3.7 max.	2.7 max.	–	–	–

Diesel fuel	1998	Jan. 00	Jan. 03	Jan. 05	Jan. 08
Sulfur (max.)	500 ppm	350 ppm	–	50 ppm*	10 ppm
Cetane (min.)	49	51	–	51	**
Polyaromatics	–	11% max.	–	11% max.	**
Specific gravity (max.)	860	845	–	845	**

Heating Oil	1998	Jan. 00	Jan. 03	Jan. 05	Jan. 08
Sulfur (max.)	0.2%	–	–	–	0.1%

Fuel Oil	1998	Jan. 00	Jan. 03	Jan. 05	Jan. 08
Sulfur (max.)	–	–	1%	–	–

* Motor fuels meeting the 10-ppm-sulfur limit must be available on the market.

** The Commission may set new values before 2006.

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in these heavy fuel oils may not exceed 4.5% by weight; in SOx Emission Control Areas (the Baltic Sea, North Sea and English Channel), it may not exceed 1.5%.

The use of heavy fuel oils for overland transport comes under Directive 1999/32/EC relative to the limitation of polluting emissions. This directive set a maximum sulfur limit of 1% by weight, effective January 1, 2003 and applicable to the fuel oils used at large combustion installations (except refineries). For refineries, it establishes average emission limit values according to the bubble concept, especially for SO₂. For existing refineries, the limit values imposed on stack effluents are currently 1700 mg SO₂/Nm³. As of January 1, 2008, they will be lowered to 1000 mg SO₂/Nm³. Under this directive, refinery installations do not have to be modified: a refinery may burn fuel oil with a sulfur content of over 1%, provided that scrubbing systems remove the sulfur from the stack effluents. Alternatively, the refinery may burn a combination of natural gas and high-sulfur fuel oil. In the medium term, however, the plan for installations rated at over 400 MW (power plants) is to impose sulfur levels of 200 mg/Nm³ as opposed to 400 mg/Nm³. Eventually, there will be a problem with availability on the European market as far as heavy fuel oil containing less than 0.5% sulfur by weight (much less 0.3% sulfur) is concerned.

In the United States, the program to ban MTBE (methyl tert-butyl ether) is still underway. The sulfur in motor fuels is to be lowered to 30 ppm on average for gasoline and to 15 ppm for diesel by 2006.

Facing a double imperative — reduce greenhouse gas emissions (especially CO₂) in the transport sector and decrease oil dependence — biofuels present serious advantages that should promote wide use.

In Europe, Directive 2003/30/EC sets incremental, non-compulsory biofuel consumption targets for the transport sector, from a minimum content of 2% by 2005 to 5.75% by 2010 (the percentage is measured in energy). In addition, a directive relative to taxation authorizes member states to grant partial or full exemptions on motor fuel excise taxes.

Industry uses two types of biofuel:

- vegetable oil methyl esters (VOME), produced mostly from rapeseed in Europe, for incorporation in diesel fuel;
- ethanol, used in the form of ETBE (ethyl tert-butyl ether) in Europe or included directly in the gasoline pool in Brazil and in the United States.

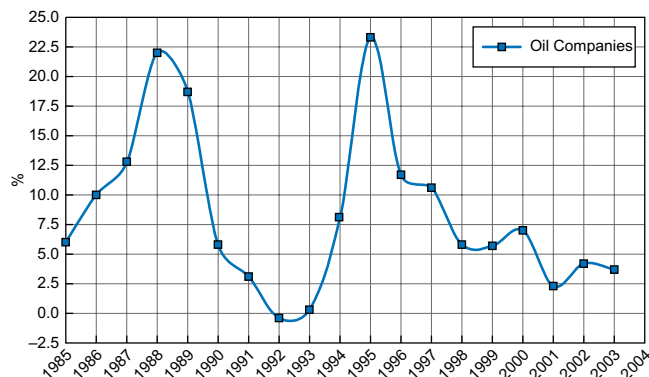
The BTL (biomass to liquid fuels) technologies, still under development, use Fischer-Tropsch synthesis to produce diesel fuel from biomass.

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Business Environment

In 2003, the long-awaited turnaround did not happen. For most majors, the petrochemicals and heavy chemicals sectors recorded an overall return on assets of 2.6% versus 4.1% in 2001, which blocked the industry at the bottom of its cycle. The chemicals branches of oil companies did better with a return on assets of 3.7% in 2003 and of 4.2% in 2002, but they, too, seem stuck at cycle bottom (see Fig. 2).

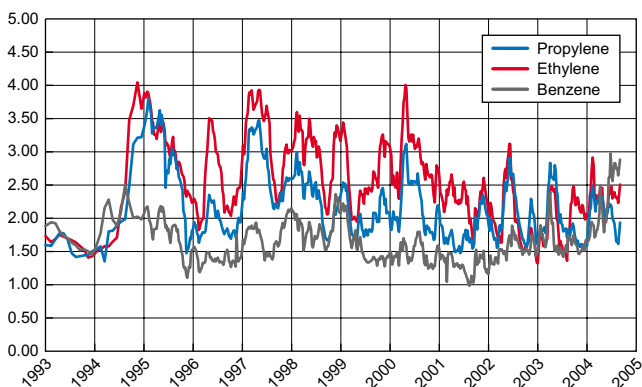
Fig. 2 Variations in the return on assets (%) for the petrochemicals businesses of the oil majors



Source: *Petroleum Economist*

In 2003, the petrochemicals industry was adversely affected by poor business conditions. In particular, it was penalized by the rising costs of feedstock (especially naphtha) and fuel oil.

Fig. 3 Variations in spot prices versus naphtha prices (NW Europe)



Source: *European Chemical News*

Nor was demand for key products growing fast enough to absorb additional production as excess capacity came back onstream. In a very competitive market, it was difficult to raise prices sufficiently to pass on increases to customers. This resulted in slimmer margins.

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At the end of first-half 2004, the situation looked no better. The petrochemicals sector was hard-hit by soaring crude prices. The price of naphtha, its key feedstock, reached US\$430/t after having been quoted at less than US\$300/t in early 2004 (NWE market). In Europe, petrochemicals firms will only be able to see the situation improve if oil prices fall and demand for petroleum products remains strong.

Handicapped by higher feedstock and fuel costs, the European petrochemicals industry must also compete with competitively priced ethylene imported from the Middle East, produced from cheap ethane at large steam cracking units.

All in all, the petrochemicals industry is not expected to emerge from the bottom of its cycle before the second half of 2005, assuming that the price of crude oil — hence naphtha — drops by a significant amount.

Financial Results

In 2003, most petrochemicals companies saw net earnings fall or stagnate, with the sole exception of ExxonMobil, which boosted net earnings by 72% over 2002. These good results are probably due to the company's domination of the booming olefins/paraxylene market and the efficient integration achieved by its petrochemicals units and refineries (over 90% of its facilities).

With margins at such low levels, petrochemicals firms, especially in Europe, are postponing capital projects and many are restructuring their assets. Today, Europe only represents 21% of world petrochemicals capacity, down from 30% in 1990. This trend should persist over the period 2004-2010.

Table 7
Net earnings of petrochemicals companies (in M\$)

	2002	2003	Variations
Total	422	287	-32%
Chevron-Texaco*	86	69	-20%
Exxon-Mobil	830	1432	+72%
Shell	565	-209	-137%
BP	515	568	+10%

* Chevron-Texaco formed a joint venture with Conoco-Phillips for chemicals activities.
Source: Annual reports

Capital Spending in the Petrochemicals Industry Worldwide

After remaining constant for two consecutive years, capital spending fell in 2003. This was mainly due to the poor financial results of previous years and a business environment that remains unfavorable to new projects. Most investment is occurring in the Middle East and in China, where three complexes (Nankin, Shangai and Huizhou) totaling 2.4 Mt of

ethylene production capacity, are scheduled to start up in 2005-2006.

On the other hand, maintenance expenses continue to climb steadily, due to the need to boost the reliability, flexibility and profitability of existing units.

Table 8
Capital spending in the petrochemicals industry worldwide (in G\$)

	2001	2002	2003	2004 (e)
Capital investment	15.3	15.3	14.9	14.9
Maintenance*	20.3	21.1	22.0	22.7
Catalysts and chemicals	21.3	21.6	21.9	21.8
Total	56.9	58.0	58.8	59.4

* 40% on equipment, 60% on labor and services.

Source: IFP based on data from HPI Market Data

(e): estimate

At a time when competition is becoming fiercer due to products from the Middle East and Asia, especially China, the European petrochemicals industry must reduce fixed costs (increase the average size of production units) and maximize integration with the refining sector. Otherwise, capital spending will keep flowing to these two regions, which can count on high growth rates, less stringent regulations and an increasing concentration of client industries.

In the face of these difficulties and challenges, it appears that the European petrochemicals industry has entered a phase of big transactions, like those announced during the first half of 2004.

First of all, Total unveiled a divestment plan to sell one-third of its chemicals business and create a new entity by the name of Arkema, for chlorinated products, intermediates and high-performance products. The new entity would arrange alliances or mergers with other European players.

BP then announced its own plan to sell off half of its petrochemicals activity, *i.e.* its olefin and derivatives assets, by 2005. These businesses, whose share capital is valued at 13 billion euros, were not found sufficiently profitable.

Next, Shell and BASF declared their intention to sell Basell, their fifty-fifty joint subsidiary. Number One on the European polyolefin market, Basell reported 2003 sales of 6 billion euros.

As for Boréal, the other big player in polyolefins, two of its shareholders, Statoil (50%) and OMV (25%), said they were considering withdrawing from the petrochemicals business.

Given such unfavorable market conditions and trends, this wave of reorganization may well continue. The potential beneficiaries include Middle Eastern companies like SABIC,

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which acquired DSM two years ago, or PIC, based in Abu Dhabi, UAE, which already holds a 25% interest in Boréal.

Conclusion

In an economy characterized by confirmed but unevenly distributed growth, world demand for petroleum products grew substantially in 2003 (+2.3%). In 2004, it should grow even faster (+3.4%) but, according to forecasts, it will not exceed +1.8% in 2005, adversely affected by elevated crude prices.

Refining margins showed a clear improvement in 2003. This upswing should be borne out in 2004 (as confirmed by the results for the first half-year), thanks to higher petroleum product prices and despite soaring oil prices. Consequently, the oil companies posted 2003 earnings that were up considerably over 2002. This trend was confirmed by the results obtained for the first half-year 2004.

In 2003, improved refining margins gave operators more leeway for capital spending, up 2.4% over 2002. However,

according to forecasts for 2004, this uptrend will not continue; the volume of investment is expected to stay flat. On the other hand, spending on catalysts and maintenance continued to grow, to improve petroleum product quality and bring them into conformity with prospective standards, aimed primarily at reducing the sulfur content. This type of expenditure should continue to rise in 2004.

In the petrochemicals industry, the return on assets obtained by the oil majors in 2003 persisted at the bottom of the cycle. Owing to higher feedstock costs, the implementation of new capacity and more intense competition, it was not possible to improve margins in 2003. These unfavorable business conditions, aggravated by soaring crude prices, continued to prevail in the first half-year 2004. The outlook is not expected to look brighter before the second half of 2005.

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