

## Refining: varying conditions by region

The economic crisis has further weakened a sector that was already facing difficulties, if we look beyond the flush period (2005-2008) when, buoyed by strong demand, margins remained high and refiners could generate profits while maintaining a healthy level of activity. Falling demand and increased overcapacity in some regions — the immediate consequences of the deteriorating economic conditions over the past two years — have led to declining margins and to financial accounts being in the red. The adoption of increasingly stringent emissions standards and product specifications, burdensome regulatory requirements for refineries (for combating local pollution and reducing greenhouse gas emissions), stiffer competition from new fuels: all of these structural factors are weakening the sector, especially in industrialized nations with their more rigorous regulatory compliance. In this generally gloomy climate, numerous new projects are still being envisaged — although many have recently been postponed and tend to be concentrated in developing countries.

### Increase in global refining overcapacity

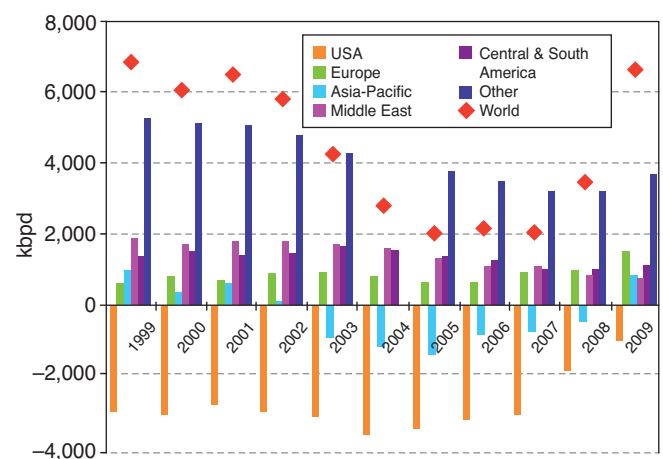
The year 2009 brought a decline in global oil consumption and, consequently, greater refining overcapacity, which rose to 6.8 MMbpd. With a push from economic momentum in selected regions, refining capacity will increase worldwide, exacerbating existing surpluses even further. This trend is the result of conditions that vary considerably from region to region.

In the Asia-Pacific region, refining capacity has been largely unaffected by the slowing world economy. After a period when capacity rose only moderately, new capacity was created at a rapid pace in 2009 (+6.4%). At the same time, growth in demand for oil slowed to 1.3%, resulting in mild overcapacity (0.8 MMbpd). Within the region, China and India have once again turned in a remarkable performance. By contrast, Japan experienced a marked drop in domestic demand, while refining capacity remained stable.

For the second consecutive year, the USA posted a sharp drop in oil demand and virtually no change in refining capacity, with the result that the capacity deficit was reduced from 3 MMbpd to 1 MMbpd over a three-year period. North America remains the sole region with a capacity shortage, despite a clear trend towards eliminating this imbalance. Declining consumption of distillate

(-12%) and residual fuel oils (-14%) is spurring this trend. Petrol consumption is also dropping (-1%) in the face of policies to promote energy efficiency and biofuels. Accordingly, imports of petrol — notably in Europe — fell significantly for the third consecutive year. In the wake of declining demand, refinery utilization rates dropped substantially to little more than 80%, while stocks of crude oil and products continued to swell to new records.

Fig. 1 - Refining capacity surplus/shortage, by major region



Source: IFP Energies nouvelles, based on the BP Statistical Review of World Energy 2009

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Europe saw a similar trend, with a major drop in demand and a slight reduction in refining capacity. 2009 was characterized by falling demand for every product, notably naphtha (-7%) and residual fuel oil (-13%). The challenges facing Europe's refining sector over the short and medium terms have not changed: it must find markets for surplus stores of fuel at a time of slowing consumption (notably in the USA), and it must import middle distillate to offset a structural shortage of refining infrastructure.

In the Middle East, growth in demand remained strong (+4%) despite a mild slowdown, and refining capacity rose at a comparable pace (+3%). In Central and South America the situation was unchanged from 2008, with both demand and refining capacity holding steady. Given these conditions, refinery utilization rates fell sharply from 81% in 2008 to 71% in 2009. Elsewhere, the Russian Federation in particular reported major surpluses. Russia is an exporter of products to Europe, notably middle distillate.

Worldwide, rising surplus refining capacity can be attributed to opposing trends: demand continues to fall while refining capacity is steadily increasing, despite generally unfavourable conditions. In 2008, surplus capacity stood at 2 MMbpd, while today it has risen to 7 MMbpd.

For 2010 and 2011, the IEA predicts that global demand will increase by 1.8 MMbpd and 1.4 MMbpd respectively. Demand for petrol is likely to reach 86.6 MMbpd in 2010 and 87.9 MMbpd in 2011. These forecasts assume a relatively strong economic recovery worldwide (annual growth of 4.8% in 2010 and 4.2% in 2011), but with significant regional variations: while countries outside the OECD seem to have moved beyond the crisis (with growth of 6.8% and 6.4% projected for the next two years), the OECD area and specifically the euro zone are facing the long-term prospect of weak growth (1% in 2010 and 1.3% in 2011). New refining capacity will be installed in the coming years, especially in emerging countries where demand is strong<sup>1</sup>. Conversely, we are likely to see a new initiative to reduce capacity — alongside efforts to restructure the refining base — in the industrialized nations, specifically Europe and the USA, driven by slowing demand and competition from middle distillate imported from Russia and Asia.

### Continued poor refining margins

The drop in demand and the worldwide increase in refining capacity severely battered refining margins in 2009, a trend that continued into 2010 despite a slight improvement in the first quarter.

[1] China's Sinopec asserts that China's refining capacity will grow by 50% between now and 2015. It is projected to total 10.2 MMbpd by the end of 2010, soaring to 15 MMbpd by 2015

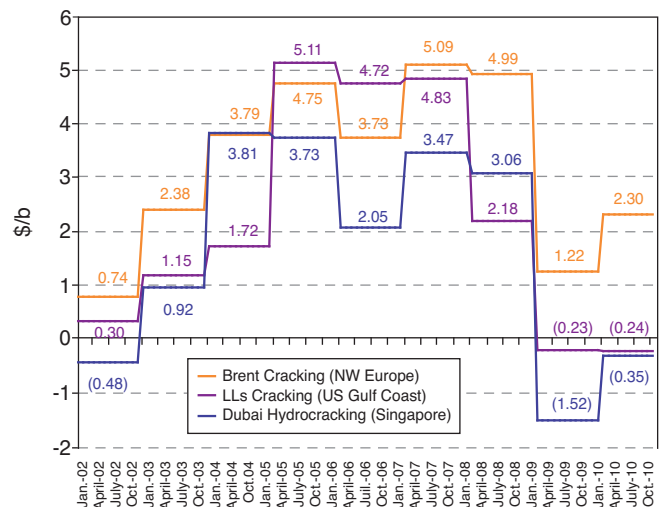
On the European market, the Brent cracking margin is strengthening, rising from an average \$1.22/barrel in 2009 to \$2.30/barrel for the first three quarters of 2010, peaking at \$3.45/barrel in April as a result of seasonal consumption patterns in Europe during the first half of the year. The spot petrol-crude and diesel-crude crack spread initially rose, which helped to maintain margins during the early months of 2010, but margins collapsed in the third quarter as a result of a very low petrol-crude and naphtha-crude differential, even while the diesel-crude differential recovered somewhat. Margins increased significantly at the start of the last quarter in reaction to tensions over the supply of light products and middle distillate in particular after strikes in France.

On the US market, margins certainly improved but remained quite poor during the first three quarters of 2010, reflecting falling demand. Despite the traditional hike in demand during driving season, petrol-crude and diesel-crude differentials continue their downward trend. A number of refineries being back in the maintenance in the last quarter helped maintain margins, albeit low ones. There are no tensions on the oil markets, as stocks of crude and petroleum products hit new records in 2010.

As is in the US market, margins in Asia remain seriously impaired. The economic slowdown and the continued creation of new refining capacity — despite a cyclical downturn in 2010 — have combined to drive margins further down. Unfortunately, conditions are likely to worsen with the completion of maintenance projects on several refining units in the region.

Around the world, moderate demand coupled with continually expanding refining capacity will have the effect in 2010 and probably 2011 of keeping margins too low to maintain a reasonable level of profitability in refining operations.

Fig. 2 - Change in monthly and annual complex refining margins



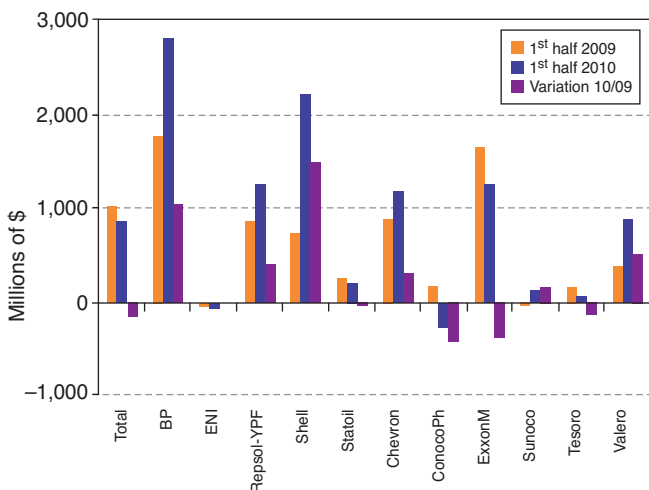
Source: Oil Market Report (IEA), IFP Energies nouvelles

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### An ongoing decline in net income

In 2009, the repercussions of the crisis were strongly felt by oil companies, whose refining divisions reported substantially worse financial results. With the exception of Shell, all of the companies, both European and American, posted much lower earnings than in the previous year (2008), and three had negative results. These included Sunoco and Valero, companies that operate exclusively in the downstream segment of the oil industry (Figure 3). The average decline for all companies was 67%, with larger shortfalls among US companies (-86%) than European firms (-40%). These results reflect the collapse in refining margins to their lowest point in 2009.

Fig. 3 - Net corporate income in the refining-distribution sector, first six months of 2009-2010



Source: IFP Energies nouvelles

There has been steady improvement in 2010, thanks to a relative recovery in demand and improving refining margins. During the first six months of 2010, half of the companies surveyed here reported results that were markedly improved over the same period a year earlier. Profits at these firms rose an average of 34% over the same period in 2009. The European companies generally performed better than their US counterparts, notably BP and Shell and, to a lesser extent, Repsol-YPF.

Overall, the companies surveyed bore the full brunt of the slowdown in demand caused both by the recent economic recession and by numerous measures designed to reduce energy consumption, notably in the industrialized nations.

### In China, tensions regarding the price-setting mechanism

China plans to add 3 MMbpd of new refining capacity between 2010 and 2015, at an average annual pace of 0.5 MMbpd, to keep up with increasing demand. As part of an ambitious plan for growth, Chinese refiners, notably Petrochina, are calling for an expansion of the changes introduced last year in the country's price-setting mechanism for products sold to the local market, in order to reflect current market realities. Petrochina executives say the company's decline in profitability in 2010, with net earnings from refining operations down 68%, is primarily due to low margins caused not only by the economic downturn but also by the price-setting mechanism, which is hurting refineries financially. Sinopec, Asia's largest refiner, is facing the same problem. However, in light of the natural disasters that have occurred in China in 2010, any further price flexibility will be difficult to achieve in the near term.

### A slowdown in refining industry spending

Existing multiyear investment programmes cannot be cancelled or abruptly put on hold (although they can potentially be deferred), and as a result they may not be aligned with short-term trends in the economic cycle.

In 2009, spending in the three main budget areas — capital, maintenance, catalysts and chemical products — rose 5% over the previous year, but this represented a smaller increase than in the rosy years prior to the economic crisis (with increases of 9% in both 2007 and 2008). Spending on catalysts and chemical products (proportional to refinery processing) showed the biggest decline as operations have slowed. Meanwhile, refining capacity grew by only 2% during the period.

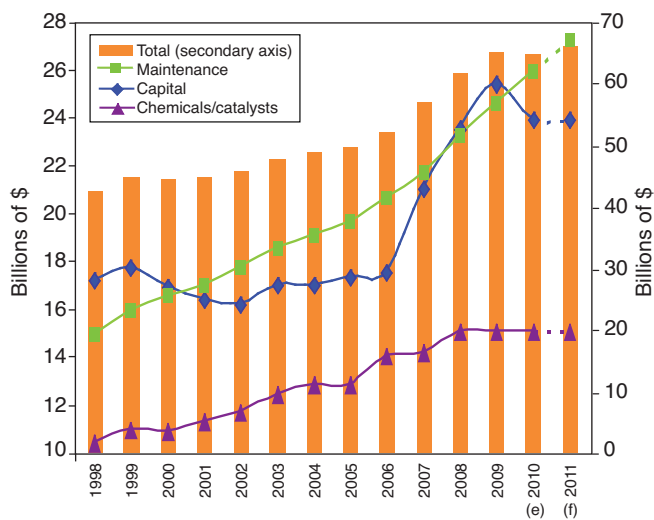
In 2010, the impact of the crisis has been quite visible. Spending projections reflect curbs on spending at refineries: down 0.3% overall, with a marked reduction in capital spending (-6%). Maintenance expenditures, which are relatively stable in comparison with historic growth rates, are growing by 5.3%. Spending on catalysts and chemical products has not increased and has even diminished slightly (-0.3%), reflecting the slowdown in activity.

In 2011, total investment is likely to rebound slightly (+2%) with help from the emerging economies. If this projection is to be borne out, oil demand in these countries will need to grow at a steady, long-term pace, and

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refining margins must continue to increase as they did in the second quarter of 2010. This relative recovery will be driven primarily by maintenance spending, which is likely to continue rising, and by stable (instead of decreasing) levels of capital spending and spending on catalysts and chemical products. However, there is major uncertainty regarding the future of certain refineries in the OECD countries, where declining demand for oil seems to be a structural development (as a result of energy efficiency, competition from alternative energy sources, petroleum standards, etc.).

Fig. 4 - Change in refining industry global expenditures



Source: IFP Energies nouvelles based on HPI Market Data; (e) estimation, (f) forecast

### The adoption of tighter emission standards

Improvements in the quality of fuels and heavy fuel oil will continue.

- In Europe, the Euro 5 and Euro 6 fuel standards:
  - in the category of light vehicles, the Euro 5 standards apply to all new-model passenger cars as of September 2009 and all light utility vehicles (Cat. 1) as of September 2010. For light commercial vehicles and special-needs vehicles, the standards are applicable as of January 2012. Beginning in January 2011, the Euro 5 standards apply to all new vehicles. The Euro 6 standards will be applicable for all new-model passenger vehicles in September 2014, and for light commercial vehicles and special-needs vehicles in January 2015. As of September 2015 the Euro 6 standards will apply to all new vehicles (Table 1).
  - heavy vehicles registered for the first time in the European Union must comply with the Euro 5 stan-

dard as of 1<sup>st</sup> October 2009. Maximum emissions of nitrogen oxide have been reduced from 3.5 g/kWh in the previous standard, which came into force on 1<sup>st</sup> October 2006, to 2.0 g/kWh. Limits on emissions of hydrocarbons (0.46 g/kWh), carbon monoxide (1.5 g/kWh) and particulates (0.02 g/kWh) are unchanged. The next Euro standard will take effect on 31 December 2012 and will tighten emission requirements for nitrogen oxides by a further 80%, while also reducing limits on hydrocarbons (by 72%) and particulates (by 50%).

- The IMO continues to introduce new standards for bunker oil at the regional and international levels. In 2010 the sulphur content of marine fuels in Sulphur Emission Control Areas (SECAs) has been reduced from 1.5 to 1.0%. The next reduction is scheduled for 2012, when fuel sulphur content worldwide will be cut from the current level of 4.5 to 3.5%. The target objective is to reach 0.1% in the SECAs by 2015 and 0.5% worldwide by 2020<sup>2</sup>.
- A new SECA was recently established in North America and is expected to be operational beginning in August 2011. Regulations introduced in California call for reductions in the sulphur content of diesel fuel and marine diesel oil as of January 2012. The current limits (1.5% and 0.5% respectively) will be reduced to 0.1%.
- China and India, the two other major markets, have adopted new provisions for improving product quality that are modelled on EU regulations. Although delayed, the new rules will be rapidly implemented in stages according to a fixed timetable, initially in the major cities and then country-wide. Some examples:
  - In China, the city of Shanghai adopted the Euro 4 standards for petrol and diesel fuel in 2009; by the end of the year the Euro 3 standard was extended to the entire country for both types of fuel. The city of Guangzhou is implementing the Euro 4 standard for petrol and diesel fuel in 2010, while in 2012 Euro 5 for petrol and diesel fuel will be applicable in Beijing. The sulphur content of petrol sold throughout China must be reduced from 150 ppm to 10-50 ppm, depending on petrol quality, by a date that has yet to be defined. In Guangdong, Shanghai and Beijing, petrol is already subject to a cap of 50 ppm. A number of cities, including Beijing and Guangzhou, have been selling diesel fuel containing no more than 50 ppm of sulphur for the past several months.

[2] Or 2025, depending on the findings of a study that is supposed to determine both the availability of low-sulphur-content fuel and also the effective date for the 0.5% limit

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Table 1  
Euro 5 and Euro 6 standards for light vehicles

	Dates (g/km)	CO (g/km)	NMhc (g/km)	Hc (g/km)	Hc+NOx (g/km)	NOx (g/km)	PM(2) (g/km)
Gasoline							
Euro 5a	Sept. 2009 <sup>(1)</sup> January 2011 <sup>(2)</sup>	1.0	68	0.10	-	0.06	0.005
Euro 5b	Sept. 2011 <sup>(1)</sup> January 2013 <sup>(2)</sup>	1.0	68	0.10	-	0.06	0.0045 <sup>(3)(4)</sup>
Euro 6	Sept. 2014 <sup>(1)</sup> Sept. 2015 <sup>(2)</sup>	1.0	68	0.10	-	0.06	0.0045 <sup>(3)</sup>
Diesel							
Euro 5a	Sept. 2009 <sup>(1)</sup> January 2011 <sup>(2)</sup>	0.50	-	-	0.23	0.18	0.005
Euro 5b	Sept. 2011 <sup>(1)</sup> January 2013 <sup>(2)</sup>	0.50	-	-	0.23	0.18	0.0045 <sup>(4)</sup>
Euro 6	Sept. 2014 <sup>(1)</sup> Sept. 2015 <sup>(2)</sup>	0.50	-	-	0.17	0.08	0.0045

Source : IFP Energies nouvelles based on different european directives

- (1) News models  
(2) All registration  
(3) Direct injection vehicles

(4) The proposal for the Euro 5 and Euro 6 technical regulations applicable to light vehicles includes a stage Euro 5b that will introduce PMP procedures developed by the EEC-UN to measure the mass and particle number (PN), with limits on particle number of  $6 \cdot 10^{11}/\text{km}$  and revised limits for the mass of particles of 4.5 mg/km (compared to 5 mg/km in Euro 5 stage)

- In India, 13 cities will be subject to Euro 4-level standards (Bharat IV) governing petrol and diesel fuel by the end of 2010, and sulphur content will be limited to 50 ppm.

The variety of new standards that are gradually being rolled out in virtually every region of the world pose technological and financial challenges for refiners. For several years, manufacturers have enjoyed highly favourable market conditions, strong demand and record margins. In this new environment, the refining sector is in a much weaker position to tackle the challenges of the future.

### A diminishing number of new projects and projects being postponed

A distinction should be made between two types of projects. Probable projects have a high likelihood of being carried out whereas possible projects tend to be announced for their effect and are less likely to materialize.

#### Distillation capacity

If only probable projects are considered, new distillation capacity worldwide would total 7.8 MMbpd in 2010, an 18% drop from the number of projects identified in 2009 (which was up 9% from 2008) (Figure 6). This represents a reversal of the trend compared with previous years driven by a number of major projects starting up particularly in Asia and by postponement of many projects.

We have seen a sharp drop in the number of projects in the Asia-Pacific region (-39%) and, to a lesser degree, in the Atlantic Basin (-12%). In the Middle East, by contrast, the number of new projects surged higher in 2010 (+60%). The worldwide decline in distillation projects is significantly affected by trends in Asia and the Pacific, given the region's weight with regard to identified new projects as a whole.

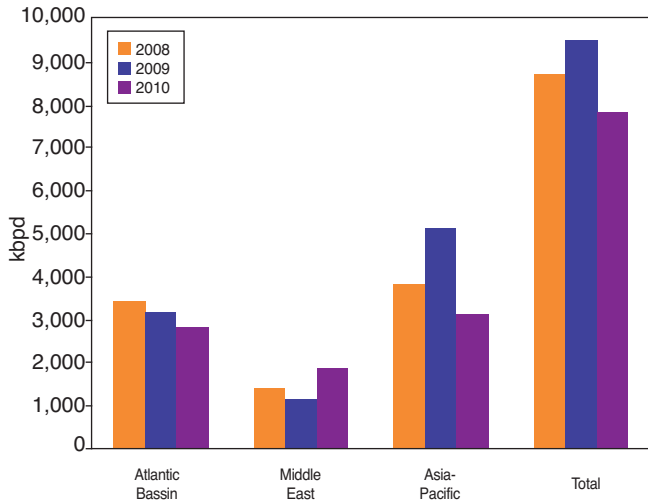
The increase in the Middle East is primarily attributable to projects in Kuwait and Saudi Arabia. In Kuwait, additional capacity of 454,000 bpd will be created at the Mina Abdullah (KNPC) refinery between now and 2014 (despite the shutdown of 200,000 bpd in capacity), while Saudi Arabia will see two new refineries, each with a capacity of 400,000 bpd: Jubail-2, scheduled for completion in 2013 (Saudi Aramco/Total), and Yanbu, expected in 2014 (Saudi Aramco/ConocoPhillips).

The decline in the Asia-Pacific region is not simply due to China, where the decrease (-14%) is considerably below the regional average, but primarily to India (-41%), Vietnam (-56%) and Japan, which launched a large-scale initiative to streamline its capacity in 2010 (down 380,000 bpd). In India, the giant Jamnagar refinery (580,000 bpd) began operations in the second half of 2009, as did Vietnam's Dung Quat refinery, with capacity of 130,000 bpd. Similarly, a number of new refineries have come on line in China (the CNOOC refinery in Huizhou, with capacity of 240,000 bpd, and the Liaoning Huajin refinery, with capacity of 100,000 bpd), accompanied by numerous capacity expansion projects, including the Sinopec/ExxonMobil/Saudi Aramco refinery in Fujian, where capacity will be expanded from 80,000 bpd to 240,000 bpd.

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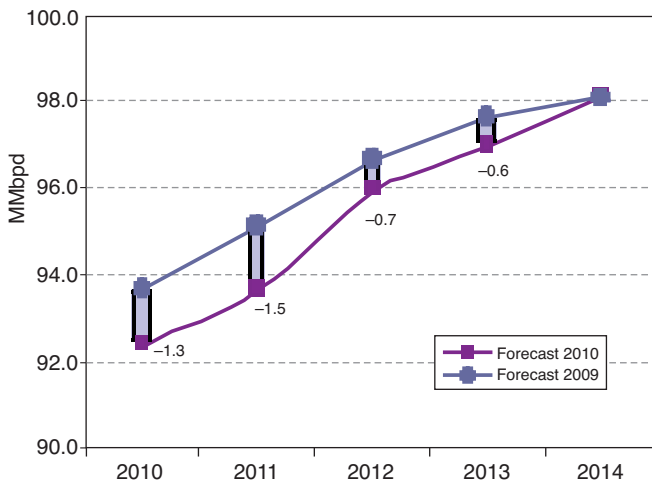
Every region in the Atlantic Basin posted a decline in 2010, with the largest downturn seen in Europe (-34%).

Fig. 5 - Refining projects – distillation capacity by geographic region



Source: IFP Energies nouvelles based on data from KBC

Fig. 6 - Refining projects, distillation capacity – 2009-2010 forecasts



Source: IFP Energies nouvelles based on data from KBC

With regard to both new refineries and capacity expansion projects, the Asia-Pacific region boasts far and away the greatest number of initiatives of any region considered, accounting for over 40% of projects in each category.

2010 generally saw a fall in the number of projects getting underway, with many others being postponed. These accounted for 26% of the total number of projects in 2010<sup>3</sup>. Asia, with 43% of the total, has seen the greatest number of projects being postponed - particularly in India and China, which account for 90% of the total number of projects postponed in the region. In North America, 30% of all projects have been postponed to a

<sup>(3)</sup> Measured in capacity (bpd)

later date, with 17% of suffering the same fate in South America. Only projects in the Middle East and Africa still seem to be spared.

Overall, estimates drawn up in 2010 show a net fall in the number of projects being planned for the mid-term. In addition to the reasons mentioned above — a number of major commissionings and many projects being postponed — the measure of caution being exercised in the face of economic uncertainty can probably explain this fall.

### Conversion capacity

If we consider probable projects only, new conversion capacity stood at 6.4 MMbpd in 2010, a 9% drop from the previous year. As is the case with distillation projects, the commissioning of a certain number of projects is behind this fall.

The volume of conversion projects in Asia and the Pacific, like that of distillation capacity projects, has significantly slowed (-31%), while the number of probable projects in the Atlantic Basin is virtually unchanged (+2%) and is rising once again in the Middle East (+46%).

Within the Atlantic Basin, North America is the only region to report an increase in conversion capacity in 2010 (+24%).

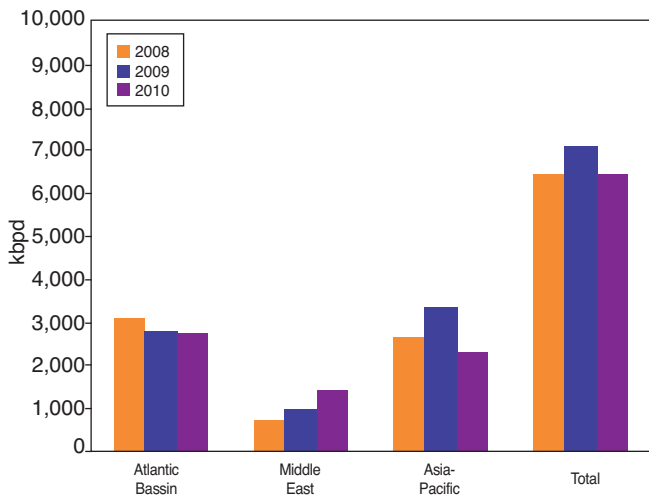
Among the more influential countries in the Asia-Pacific region, the impact of the crisis has been felt less strongly in China than the regional average, with conversion projects down 22%. India has been especially hard hit, with a marked drop (-37%) in conversions as a result of the same factors causing a drop in distillation projects: the start-up of operations at the Jamnagar refinery (16,000 bpd delayed coker unit, 18,000 bpd catalytic cracking unit) and the launch of the Vadinar refinery's 50,000 bpd delayed coker unit. The smaller number of conversion projects in China can mainly be attributed to the commissioning of several assets.

In the Middle East, new projects have led to an increase in conversion capacity. The most significant of these are at the Mina Al-Ahmadi refinery in Kuwait, which has two conversion units including a 50,000 bpd ARDS unit and a 37,000 bpd delayed coker unit, and in Saudi Arabia at Yanbu (124,000 bpd hydrocracker facility and an 80,000 bpd delayed coker unit) and Jubail-2 (80,000 bpd hydrocracker unit, 80,000-bpd delayed coker unit and 120,000 bpd FCC unit).

A number of conversion projects have also been postponed (22% of the total number of projects in 2010). Asia — which boasts the largest number of projects — accounts for nearly 40% of all postponements, with North America accounting for a little under a third. The rest are spread across the CIS and the European Union.

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Fig. 7 - Refining projects – conversion capacity by geographic region

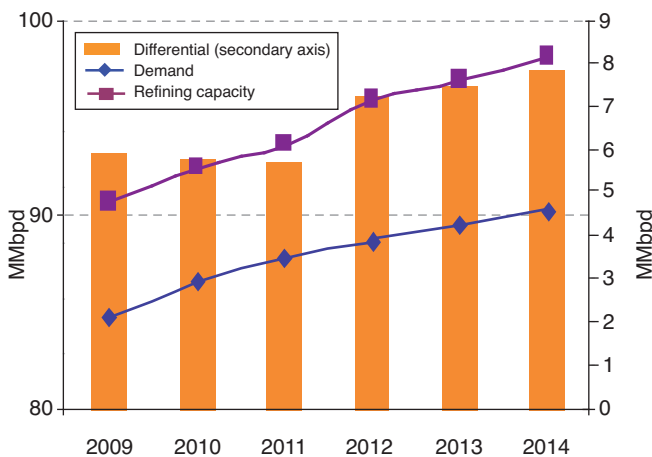


Source: IFP Energie nouvelles based on data from KBC

### Continued overcapacity in the medium term

Overall, refining overcapacity will continue for several more years. In view of additional capacity, medium-term operating capacity and projected oil demand according to the IEA<sup>4</sup>, which foresees a downward trend in world oil demand over the long term<sup>5</sup>, the situation should deteriorate between now and 2014. Given the uncertainty over when and how quickly a more sustainable economic recovery can be expected, oil demand could once again post a decline that would simultaneously highlight the industry's overcapacity, at least initially.

Fig. 8 - Medium-term trend in refining capacity and demand



Source: IFP Energie nouvelles based on data from KBC

However, a region-by-region analysis reveals very different conditions, depending on the intensity of demand. In the

[4] WEO 2010

[5] Average annual growth of 0.9% between 2009 and 2035 for oil demand in the WEO's "current policies" scenario. (equivalent to the reference scenario of previous versions). In 2009, the forecasts in the reference scenario included growth in demand of 1.0%

OECD countries, notably the markets in North America and Europe where the trend is towards a long-term decline in demand, overcapacity will likely continue to increase. Steady - or worsening - refinery utilization rates could undermine this situation still further. In these regions, a new balance must still be drawn between refinery infrastructure and internal demand, so that the industry can respond to more stringent product quality specifications (primarily with regard to sulphur content) as well as to structural demand trends (reliance on diesel fuel in Europe, etc.). A number of oil companies, Total among them, have already embarked on this readjustment.

In emerging countries, principally China and India, the situation is different: demand is strong, and despite a declining number of new projects (reflecting the economic climate), activity is still at a healthy level. Capacity, which was recently excessive in China, is likely to mirror changes in demand<sup>6</sup>. Moreover, a phenomenon observed in recent years, whereby refinery projects involving distillation or conversion capacity are relocated to the most active emerging regions, has not changed.

### Investment needed in every region

In general, the slowdown in refining projects can be seen as a positive element in efforts to address excess capacity worldwide as well as the consequences of this overcapacity for the industry's financial health. This slowdown is in response to both cyclical factors (quick adaptation to crisis conditions, the commissioning of new assets) and structural factors (long-term decline in demand, a refining infrastructure that does not reflect demand in countries that are traditionally big oil consumers, tax on hydrocarbons in France and Europe in particular, new competition from other energy sources and the search for a different energy mix, more stringent product specifications and regulatory standards weighing on refineries). The new investment that will be needed in order to restructure the manufacturing infrastructure could intensify the trend towards mergers or other initiatives to streamline capacity, shut down less profitable assets, etc., over the medium term<sup>7</sup>.

[6] See box on China

[7] According to JBC Energy, the volume of unprofitable refining capacity in Europe likely to be closed could total 2.5 MMbpd by 2013 and 3.1 MMbpd over the next ten years, as a result of declining fuel consumption in the USA, greater competition from diesel fuel coming from Russia and Asia, and expanded use of increasingly energy-efficient vehicles. In North America this figure could total 1.8 MMbpd by 2013, but the word "potential" must be borne in mind given current consumption levels in the transport sector. When Europe and North America are combined, we find 4.3 MMbpd of excess capacity 11% of current total refining capacity in the two regions. However, these figures should be viewed with caution in light of the underlying problems with this type of procedure.

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In industrialized nations with evident overcapacity, the adjustment will be painful, requiring that some current assets be shut down; moreover, costly hydrocracker facilities will need to be built as reliance on diesel fuel becomes more widespread, especially in Europe. The primary concern in emerging countries will be to strike

a balance between investment and demand (internal and/or external) while at the same time responding to environmental restrictions.

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Final draft submitted in November 2010*

### Examples of refineries that are being or have been sold and/or are likely to be completely overhauled

#### ■ Europe

- Chevron, Pembroke, UK (210,000 bpd), for sale,
- ConocoPhillips, Wilhelmshaven, Germany (260,000 bpd), for sale or overhaul,
- Ineos, Grangemouth, UK (200,000 bpd), sale under consideration,
- Murphy Oil, Milford Haven, UK (130,000 bpd), for sale,
- Petroplus, Reichstett, France (85,000 bpd), sale or partial shutdown,
- Petroplus, Teeside, UK (117,000 bpd), conversion into terminal,
- Shell, Gothenburg, Sweden (78,000 bpd), sale likely,
- Shell, Stanlow, UK (233,000 bpd), for sale,
- Shell, Hamburg, Germany (110,000 bpd), for sale,
- Shell, Heide, Germany (91,000 bpd), for sale,
- Total, Lindsey, UK (221,000 bpd), for sale,
- Total, Dunkerque, France (137,000 bpd), conversion into terminal.

#### ■ North America and the Caribbean

- Big West, Bakersfield, USA (68,000 bpd), closed in early 2009 and acquired by Alon (February 2010), which expects to re-start operations,
- Chevron, Kapolei, Hawaii, USA (54,000 bpd), projected capacity reduction,
- Murphy Oil, Meraux, Louisiana, USA (125,000 bpd), for sale; the company is also looking to sell its third

- and final refinery in Superior, Wisconsin (35,000 bpd),
- Sunoco, Eagle Point, USA (150,000 bpd), closed in November 2009, possible conversion for biofuel production,
- Valero, Delaware, USA (190,000 bpd), sold to Petroplus (April 2010),
- Valero, Paulsboro, USA (166,000 bpd), sale under consideration,
- Valero, Corpus Christi, USA (20,000 bpd), shutdown of an FCC unit,
- Valero, Aruba, USA (275,000 bpd), closed in 2009, sale under consideration,
- Western Bloomfield, USA (17,000 bpd), shutdown at end of 2009.

#### ■ Asia and the Pacific

- CPC Corp Kaohsiung, Taiwan (25,000 bpd), shutdown of an FCC unit,
- JX Holdings Mizushima, Japan (110,000 bpd), distillation unit closed permanently (June 2010),
- Nihonkai Oil Toyama, Japan (60,000 bpd), conversion into terminal (March 2009),
- Shell Parsden Pt, New Zealand (109,000 bpd), sold to Infratil and to government pension fund (March 2010),
- Showa Shell Keihin, Japan (60,000 bpd), distillation unit closed.