Processing Trends

Gasoline and diesel imbalances in the Atlantic Basin Part 1: market outlook

Eric Benazzi, Marketing Director, Axens

Eric.benazzi@axens.net

The European refining industry is coping with declining domestic demand while the imbalance between product supply and market demand persists, in particular the deficit in diesel supply and the excess in gasoline production.

This article presents the prospects for the evolution of this situation in the coming years. A second article in a coming issue of *PTQ* will address refinery technology and solutions to rebalance output.

Current market situation: origin of the imbalance

The European imbalances are not recent; the European gasoline surplus has existed since the early 2000s, and in 2009 it exceeded 0.75 Mbdoe (million barrels per day of oil equivalent), while the diesel deficit reached about 0.5 Mbdoe (see Figure 1).

On the other side of the Atlantic, the US market presents a recurring gasoline deficit of around 0.7 Mbdoe and, since 2008, diesel has been exported.

What are the main causes of this situation?

In 2009, 144 refineries were operating in the US with an average crude oil distillation capacity by refinery of just above 120 000 b/d and a Nelson complexity index of 10.2. In Europe (EU-27), 110 refineries were listed with an average capacity of around 127 000 b/d and a Nelson complexity index of 7.3, lower than the US value.

At first glance, US and European refinery production seems to correspond well to demand. US production is around 18 million b/d and is mainly oriented toward gasoline (49% of production), while European refinery production is mainly dominated by middle distillates (42%) with a total production of about 14 million b/d.

However, is refinery production sufficiently tailored to demand? The following paragraph will further examine this question.

Figure 2 compares US refinery throughput volume with US demand for fuels. First, it can be seen that there is no fundamental inadequacy between the structure of US production when compared with demand given as a percentage. The main problem stems from the insufficient gasoline throughput, about 7.7 Mbdoe, compared to US demand, which was set at 9.1 Mbdoe in 2009. As a result, the US needs to import gasoline.

The European situation is rather different. The European refineries do not produce enough diesel — their current output is 5.2 Mbdoe whereas 5.8 Mbdoe is required — and they produce too much gasoline — 3 Mbdoe, for a demand that reaches, with difficulty,

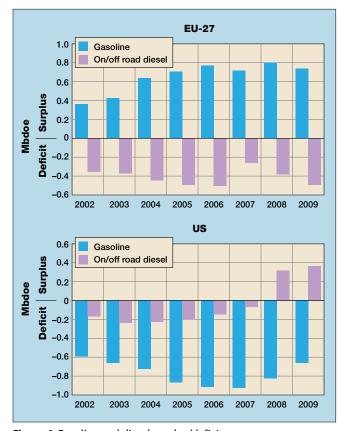


Figure 1 Gasoline and diesel surplus/deficit

Source: JODI

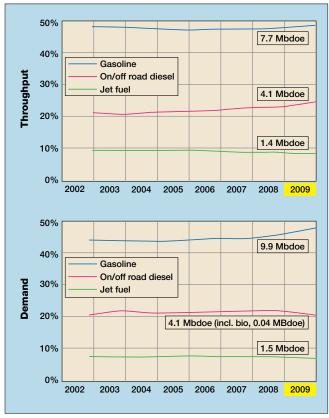


Figure 2 US refinery throughput and demand Source: DoE, JODI, Axens

www.eptq.com PTQ Q2 2011 5



Figure 3 Diesel and gasoline imports across the Atlantic, 2009

2.3 Mbdoe. As a result, it can be said that the European imbalance is structural.

Consequently, Europe is importing diesel and exporting gasoline to the US. How will the situation evolve through 2020?

Different parameters could affect the situation. The first is the change in product demand forecast. The potential impact of a change in automobile motorisation should also be taken into account. Other parameters include the effects of the level of biofuels incorporated into the on-road fuels pool and the reduction in refining capacity that could occur in the coming years.

Gasoline and diesel demand forecast: a 2020 outlook

For both Europe and the US, the demand for gasoline is forecast to decrease, whereas demand for on-road diesel should continue to increase between 2009 and

2020 (see Figure 4). Demand for diesel will continue to dominate the European fuels market with more than 30% of the market share.

During that time, the demand for gasoline will continue to represent the principal on-road fuel in the US with nearly 44% of US demand by 2020. Conversely, in Europe, gasoline will only represent 12.4% of the refined product demand including biofuels (see Figure 4).

As previously noted, on-road diesel demand should continue to grow on both sides of the Atlantic. Over the period 2009–2020, the incremental demand should represent about 0.4 Mbdoe for the US and 0.6 Mbdoe for the EU-27. Nevertheless, it is important to note that, in the US, a significant part of the incremental demand for on-road diesel for the next 10 years corresponds to a return to its highest level of 2007.

The second striking feature is that both US and European gasoline demand are expected to decrease, with European demand declining at a faster rate. In addition, if we consider the increasing amount of ethanol that will be incorporated into the US gasoline pool, it is uncertain that excess European gasoline will continue to find an outlet on the US market.

This demand for on-road fuels forecast for the US is based on the fact that US passenger car sales through to 2020 will remain in the majority for gasoline cars, with the implementation of new CAFE programmes aimed at reducing car engine fuel consumption.

For Europe, our demand forecasts are based on a reference scenario for which, by 2020, diesel passenger

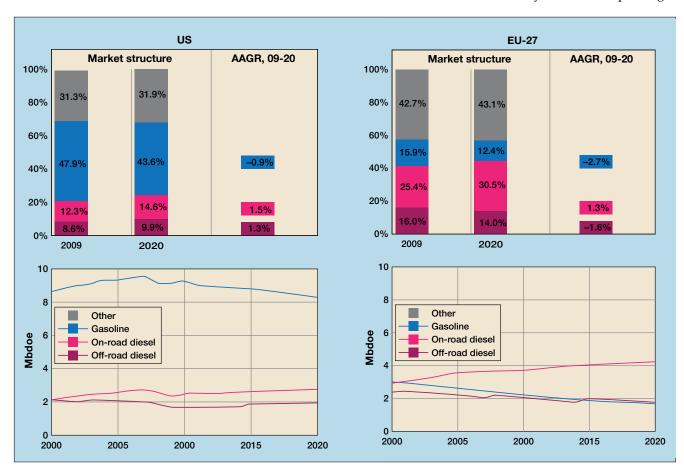


Figure 4 Forecast demand for US and European fuels

6 PTQ Q2 2011 www.eptq.com

cars would represent 54% of sales, gasoline passenger cars 36% and hybrid-gasoline 10%. With such a scenario, demand for on-road diesel will continue to increase and will represent just above 70% of on-road fuels consumption in the EU in 2020. At that time, the on-road diesel-to-gasoline ratio will reach a value of 2.5, which can be compared to the current value of 1.7 and to 0.3 for the US.

Could we expect an inversion of the trend in European demand by 2020?

At this point the question is: can this scenario be challenged, especially the European situation and assumptions? For that, it is necessary to examine automobile motorisation further.

Analysing in more detail the European market for on-road diesel, it can be observed that on-road diesel consumption is mainly attributable to commercial vehicles, including freight trucks, light trucks and buses. In 2009, they were responsible for 58% of diesel demand, whereas passenger cars represented 42% (see Figure 5). According to the reference scenario, the demand for on-road diesel should reach 4.1 Mbdoe by 2020 (see Figure 5).

In order to envisage another trend, we have generated an alternative scenario called Gasoline Plus. In this scenario, by 2020, the share of diesel passenger cars sales would decrease to 30% instead of 54%, while gasoline passenger cars sales would increase to represent 60%. This is a complete reversal of the current trend. Nevertheless, even in this case, demand for onroad diesel would be at best stabilised compared to 2009 and would reach 3.7 Mbdoe by 2020, mainly attributable to sales of commercial vehicles (see Figure 5). Demand for gasoline would by 2020 still be lower than the current level. As a consequence, even a drastic change in passenger cars sales will not be enough to

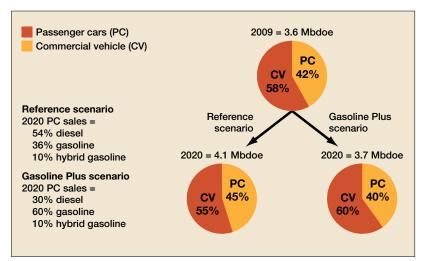


Figure 5 Breakdown of demand for on-road diesel

significantly rebalance the demand for on-road fuels before 2020 in Europe. The impact would begin to be significant only after 2025.

These scenarios have established the forecast demand picture and its limits. What will be the effect of the incorporation of biofuels and the reduction in refining capacity on the market balance around the Atlantic Basin? To consider these aspects, the 2020 reference scenario has been completed, with assumptions about the level of incorporation of biofuels and reduction in refining capacity.

Concerning biofuels, our assumption is that regulatory levels will be reached, but later than the expected schedule. By 2020, we estimate that biofuels content will reach 8% (energy basis) in Europe, well below the regulatory level, which has been fixed at 10%. For the US, our assumption is 9.5% instead of 10.7%; this corresponds to 30 billion gallons of renewable fuels by 2020, according to the RFS2 rule. These values should be compared with the current biofuels content of on-road fuels for the US and Europe, which are about 4% (0.44 Mbdoe, mainly ethanol) and 4.3% (0.25 Mbdoe) respectively.

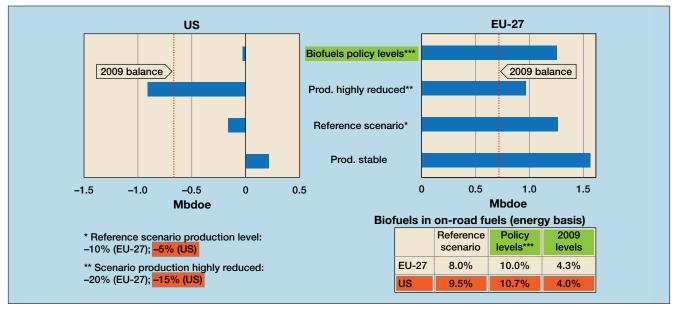


Figure 6 Gasoline imbalance simulations

www.eptq.com PTQ Q2 2011 9

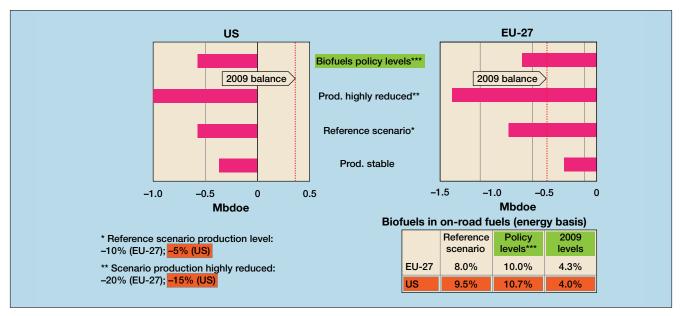
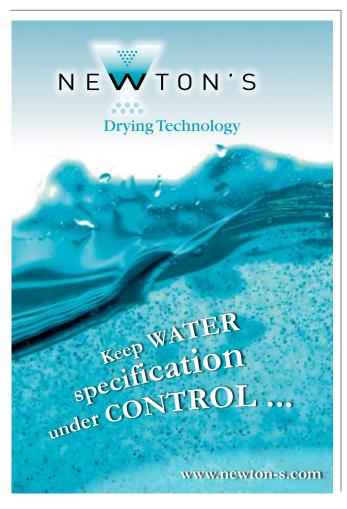


Figure 7 Diesel imbalance simulations

In addition, our reference scenario incorporates a reduction in refining capacity, both in Europe and in the US. This could reach 10% of existing capacity in Europe, in addition to the closures already carried out in 2009–2010. For the US, we anticipate a 5% reduction in capacity, a lower value than in Europe because US refinery closures have already been implemented and projects are planned to process heavy bitumen blends.



2020 fuels balance around the Atlantic Basin

Figure 6 shows the results of our simulations regarding the gasoline balance in 2020 and the impact of various parameters, such as the incorporation of biofuels at different levels and refining capacity reduction. The purple dotted line represents the current situation, a gasoline deficit, of about 0.6 Mbdoe in the US and a surplus of around 0.75 Mbdoe in Europe.

In Figure 6, the lowest blue bar, Prod. stable, illustrates what could be the change in the gasoline balance in 2020 if refining capacity remains stable, while the biofuels content increases according to our reference scenario: to 8% in the EU and to 9.5% in the US. It can be seen that, due to the trends in gasoline demand in both zones, the US gasoline deficit could move into small surplus, while in Europe the surplus could be multiplied by two in 2020.

The next blue bar in Figure 6, Reference scenario, represents a situation if, contrary to the previous case, refining capacities were reduced by 10% in the EU and by 5% in the US. It should be noted that the gasoline surplus in the EU would be only slightly reduced, whereas the US could once more experience a gasoline deficit. This is our reference scenario.

The third blue bar, Prod. highly reduced, shows what could be the impact of higher refining capacity reductions (20% in the EU and 15% in the US). In this case, the US could come largely into deficit, whereas the European gasoline surplus would be reduced but would remain at a higher level than today.

The last case in Figure 6, Biofuels policy levels, examines what could be the situation if regulatory biofuels content levels were reached. The combination of those levels with a 5% reduction in refining capacity in the US and 10% in Europe would suppress the US gasoline deficit, although in the EU-27 the gasoline surplus would rise.

To summarise, the main observations of this analysis are that, in the EU, the gasoline excess is structural and will be inflated by the incorporation of biofuels

(ethanol) into the gasoline pool and by the decline in gasoline demand. Even sizeable cuts in refinery capacity will not be enough to eliminate the gasoline surplus.

The US market presents a better fit between supply and demand. Gasoline deficit will be mechanically flattened by a decrease in gasoline demand and biofuels (mainly ethanol) incorporation.

Figure 7 shows the results of our simulations concerning the diesel balance in 2020 and the impact of various parameters, such as the incorporation of biofuels at different levels and refining capacity reduction. The purple dotted line represents the current situation, a diesel surplus in the US of around 0.4 Mbdoe and a deficit in Europe of about 0.5 Mbdoe.

In Figure 7, the lowest purple bar, Prod. stable, illustrates what could be the change in diesel balance in 2020 if the refining capacity remains stable while taking into account increases in biofuels content according to our reference scenario, to 8% in the EU and to 9.5% in the US. This shows that, due to the respective trends in diesel demand in both zones, the US diesel surplus could move into a deficit of around 0.5 Mbdoe, while Europe would continue to lack diesel.

The next bar, Reference scenario, represents what the situation would be if, conversely, refining capacities were reduced by 10% in the EU and by 5% in the US. It is notable that the diesel deficit would deepen,

especially in the EU, where it could reach 0.8 Mbdoe. This is our reference scenario.

The third bar, Prod. highly reduced, shows what the impact could be of larger capacity reductions (20% in the EU and 15% in the US). Due to the structural mismatch between EU refinery throughput and demand, such a scenario would significantly increase the EU diesel deficit, which could reach 1.4 Mbdoe in 2020. Although a reduction in refining capacity would be beneficial to the EU gasoline balance, the same cannot be said for its effects on the diesel balance. The US diesel balance would also appear to have deteriorated badly, with a deficit peaking at 1 Mbdoe.

The final case examines what the situation could be if regulatory levels for biofuels content were reached. The combination of those levels with a 5% capacity reduction in the US and a 10% reduction in the EU would help to reduce diesel deficits both in the EU and the US. But they would remain at high levels.

As a result, on-road diesel demand is expected to grow both in the EU and the US. Both zones will experience on-road diesel deficits by 2020, but US refineries are more flexible; they have the ability to implement cut-point adjustments to adapt their production to these changes. The EU's on-road diesel deficit is likely to be higher than that in the US, essentially due to an increase in demand from a situation today that is already in deficit.

Incorporating more biodiesel will contribute to a reduction in the deficit of on-road diesel, but will not be sufficient to eliminate it completely.

Conclusion

The prospect for the European market in the coming years is to remain imbalanced; the gap between supply and demand is structural and will not be impacted by new passenger car sales trends before 2020. The trends that will influence the European market's evolution are:

- Biofuels incorporation will worsen the gasoline surplus while reducing but not eliminating the diesel
- Capacity reduction cannot address both the gasoline surplus and the diesel deficit; the gasoline surplus will reduce as the diesel balance deteriorates.

The situation in the US is less strained because of a better fit between supply and demand. Furthermore, the more flexible US refineries will find it easier to adapt to changes in demand than their European counterparts. Probable trends to be monitored are:

- ullet The incorporation of biofuels and improvements in fuel efficiency will reduce the gasoline deficit to very low levels, except for the scenario where capacity is reduced by 15%
- The US market will pass from a diesel surplus to a diesel deficit.

It is notable that whatever scenario is envisaged, mismatches in supply and demand will persist. Technology and catalysts will play a major role on both sides of the Atlantic in adapting refinery production to market demand. The technical solutions to address these challenges will be presented in a second article.



www.ohl-gutermuth.de · og@ohl-gutermuth.de