Driving Innovation with Petrochemicals

Europe’s Chemical Industry Has a Secure Raw Material Basis

Petrochemicals make things happen. This is not only the tagline of the European petrochemical producers’ association Petrochemicals Europe, this is a fact: 95% of all manufactured goods such as electronics, furniture, appliances, textiles and many more are based on petrochemicals. With 300,000 people directly employed in highly qualified jobs and in total 1.2 million along the entire chemical value chain as well as an average annual contribution of €155 billion to the overall European GDP, petrochemicals represent an important economic factor.

Additionally, they are also an enabler industry for many sustainable solutions such as insulation material to save energy, durable and resistant composites for lightweight smartphones and tablet PCs, sophisticated fuel additives to save emissions from transportation, or renewable energy devices like windmill blades and solar panels for a low-carbon economy.

Smart Solutions for Big Tasks

In the future these benefits will be needed even more than in the past to meet the upcoming societal mega challenges. In 2050, more than 9 billion people will live on earth. With no major changes, mankind will need the resources of 3 planets to meet the demands of this growing population in terms of clean water, food, energy, housing, mobility and communication. The answer lies in smart solutions – another aspect underlining the crucial role of petrochemicals in driving innovation projects in close cooperation with their downstream value chain partners, universities and research laboratories.

From that perspective it seems only logical for chemical markets to grow steadily, and in fact, the global market volume is expected to increase by 3-4% each year to roundabout €6.3 trillion by 2030 from the 2013 level of roughly €3.2 trillion. Unfortunately, most of this growth will take place outside of Europe, with China alone being forecasted to account for 44% of the chemical markets by 2030. In contrast, the EU share is likely to further decline from 17% in 2013 to 12% by 2030.
due to mature markets and an ageing population.

**Petrochemicals in the EU**

In the current structure of Europe’s chemical industry petrochemicals contribute approximately 27% of the total EU sales and are, hence, a very important industry segment.

Since at the same time they mark the starting point of almost all chemical value chains, they also provide a secure raw material basis to all the subsequent segments such as specialties, fine chemicals or polymers, the more so as the majority of chemical plants in Europe is backwards integrated.

In this context it should be noted that currently Europe’s chemical industry requires 80 million t of feedstock each year, 75% of which originate from refined (= fossil) sources; renewables make up for 10%. This is a dimension which makes it extremely challenging to be substituted by renewables or bio-based raw materials without running into a competition for arable land for food, which is urgently needed to feed a strongly growing population on earth.

Moreover, the competitive advantage in Europe lies in a high level of integration and a tailor-made infrastructure, e.g. zero-emission pipeline systems to transport raw materials; both aspects are very closely linked to the current raw material basis. The pre-requisites for changing the existing system are big technological breakthroughs, which are not yet at the horizon despite ongoing research, and huge investments in new infrastructure, which will come at a certain societal cost.

**Bio-based = Sustainable?**

Another aspect to consider when comparing these two raw material options is, that “bio-based/renewable” is not necessarily always synonymous to sustainable and “oil-based/fossil” by default automatically unsustainable – in contrast to what public discussions usually suggest these days. Full-life-cycle analysis results have shown that products and processes can well be beneficial in one specific environmental aspect (e.g. greenhouse gas emission reductions), but at the same time be suboptimal in other environmental aspects, e.g. energy-efficiency or water use. This is one of the reasons why the issue is so complex and a one-size-fits-all solution rather unlikely.

To bring the previously mentioned deliberations to a conclusion: from today’s point of view it seems rather likely that oil and gas will continue entering the value chains of the chemical industry for the foreseeable future. At the same time the
current raw material basis might well further diversify with renewables/bio-based feedstock and some other alternatives finding their way into more specialty chemicals’ applications or new materials.

**Environmental Responsibility**

It should be stressed that petrochemical producers in Europe take their environmental responsibility very seriously, which implies working on further reducing GHG emissions wherever possible and enhancing circularity wherever feasible. The track record of the past 3 decades shows that Europe’s (petro-)chemical industry has substantially improved its own environmental profile: from 1990 to 2015 – a period which saw an 85% increase in production – it succeeded to reduce its GHG emissions and its energy consumption by roundabout 60% respectively, while at the same time providing the products enabling its downstream users to significantly reduce their own environmental footprint. As regards the latter, several independent studies have showcased that, e.g. for every unit of greenhouse gases emitted directly and indirectly by the chemical industry, more than two units of emission savings are enabled via products and technologies provided to other industry and consumers.

**New EU Petrochemical Projects**

Based on the above-mentioned aspects it is evident that European producers have a significant role to play also in the future. After many years, in which new investments in petrochemicals went almost exclusively to other regions - above all to the US and the Middle East - the recent announcements of new European projects came as good news for Europe. Most of the petrochemical projects announced address company-specific balance adjustments within specific integrated value-chains and are actually linked to non-crude raw materials (ethane, propane). However, they certainly also reflect to a certain extent that with the lower oil price from 2014 onwards the overall conditions for petrochemical producers in Europe have been easing up; especially the oil/gas ration has improved, and margins opened up for European cracker operators. Additionally, the demand has increased, based on renewed growth in the region.

**Overcoming Structural Challenges**

Some structural challenges have, nevertheless, remained for European petrochemical producers, especially European energy prices, which are still amongst the highest in the world, and the regulatory burden. When referring to the latter, it is not about lowering environmental standards or eliminating regulation; all European producers are fully committed to comply with the legislation. The
question is only whether the same targets could be reached in a more cost-efficient way so that European producers can compete successfully on the world markets. At the same time, it should be acknowledged that the current European Commission has raised several initiatives to tackle both issues. These are promising first steps, which are hopefully followed up further in the near future to maintain Europe’s traditionally strong industrial backbone, fully recognizing that it is very complex and quite a long journey to find optimal solutions which all EU member countries can fully support.

To balance off the above-mentioned disadvantages European producers can fortunately benefit from a series of strengths: apart from the high level of integration, a good infrastructure, strategic restructuring measures to flexibly respond to ever-changing global market conditions – which were already mentioned beforehand – it has also a skilled, motivated workforce, large domestic markets with strong customer industry clusters nearby, and increased feedstock flexibility.

Additionally, a huge part of Europe’s cracker output is based on olefins other than ethylene, such as propylene, benzene and C4 streams, which is an essential element of Europe’s broad chemical diversification. This wider portfolio range, together with the traditionally strong innovation efforts, are good prerequisites to generate new growth clusters and to solve the upcoming societal mega challenges, like energy-efficient uses or new materials.

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