



Petrochemical feedstocks: the cornerstone of competitiveness

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Future outlook

The future of much of Europe's chemical industry depends heavily upon the availability of affordable petrochemical feedstocks.

In the Middle East, where petrochemical feedstocks are cheap, and in China, where demand is surging, producers are substantially increasing capacity for a wide range of petrochemicals including polypropylene and polyethylene. In the USA, cheap shale gas and economic recovery are driving a chemical industry investment bonanza. But demand growth in the European Union is weak and output growth is modest.

The challenge for the chemical industry is two-fold. First, Europe is highly dependent upon imported feedstock. Oil, the most important, is globally traded, and input prices are competitive. But because European gas prices are generally high, we are at a competitive disadvantage for chemicals that use natural gas as a feedstock, such as ammonia, hydrogen and the precursors of polyamides and methanol. Second, many industrial processes for petrochemicals are energy intensive: cheap gas or electricity elsewhere leaves European chemical producers at a competitive disadvantage.

The industry is not about to throw in the towel, however, but must be able to access affordable feedstocks if it is to thrive and win its share against increasing global demand.

The 2009 report of the European Commission's High Level Group on the Competitiveness of the European Chemicals Industry concluded that the industry will remain largely reliant on petrochemical-based feedstocks for decades to come. But it also showed that dependence on fossil hydrocarbons, combined with high oil and gas prices and a drive to reduce the carbon footprints, have powered big efforts by the European chemicals industry to broaden its feedstock base. And, to do this, the scope for greater use of renewables as feedstocks was highlighted.

Growing our own

The chemical industry has long been involved in the so-called 'bio-economy'. Carbohydrates from sugars and starches are used today to make speciality chemicals



including enzymes, vitamins, organic acids, amino acids, polymers and thickeners for industries ranging from advanced materials to the pharmaceutical, food and feed industries. Animal fats and vegetable oils are used in the production of detergents and coatings, and natural extracts are turned into additives for personal care and cosmetics products.

More recently, consumer demand has powered the adoption of renewable raw materials and biotechnological processes such as fermentation to produce plastics. Instead of using natural gas as a feedstock, ethanol and isobutanol derived from biomass are turned into high-volume commodity chemicals, including ethylene, propylene, isobutylene and p-xylene for making polyethylene used in packaging or polyethylene terephthalate (PET) used in plastic bottles.

Although many chemical substances can theoretically be made from organic plant material, doing so is both technically and logistically challenging. Chemical feedstocks need to be of consistently high quality, and huge volumes of plant matter would be needed. Although ongoing research programmes may overcome the quality challenge, it is difficult to conceive how Europe could deliver enough bio-derived ethanol to assure the industry's current annual ethylene production of 20 million tonnes.

To justify massive investments in processing biochemical feedstocks, the European chemical industry would need access to large volumes, including imports, at competitive prices. Yet, food production should and will



take precedence in the use of farm land. Already, targets within the Renewable Energy Directive are taking away renewable feedstocks from the chemical industry, driving up the price of animal fats and pulling in imports of bio-ethanol that face heavy import duties.

Biomass from forestry products, agricultural residues and organic waste has great potential as a future source of bio-based chemicals, when the technology has been perfected, but producers of pulp, paper and renewable energy also compete for these limited materials. Bio-based feedstocks are only likely to be widely adopted in Europe if they are available in large volumes at global, cost-competitive market prices.

Converting carbon

Cefic's recently published report, *European chemistry for growth—Unlocking a competitive, low carbon and energy efficient future*¹, outlines technological developments that will influence feedstock changes in our industry. Prominent among these is the potential use of carbon dioxide as a renewable chemical industry feedstock, directly combatting global warming. Many national, regional and private company research initiatives are under way, both in Europe and elsewhere. In collaboration with more than 20 experts from academia and companies, Cefic now aims to produce a strategic research and innovation plan leading to the use of CO₂ to make chemicals, polymers and fuels. We believe that implementing this plan will help to ensure Europe's global leadership in related technologies.

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The shale gas revolution

The programmes mentioned above will take decades to deliver commercial fruit. In the meantime, the availability of cheap shale gas as a feedstock and energy source is reinvigorating the US chemical industry and putting European rivals and manufacturers at a competitive disadvantage. Shale gas will be around for many decades, providing US chemical firms with affordable feedstock and cheap electricity from gas-fired power plants.

Europe also has significant shale gas reserves. Delaying their development will increase Europe's dependence on imports, reduce the competitiveness of European industry, reduce investments in our industry, and—over time—lead to fewer jobs and a decline in Europe's share of global manufacturing. This is why the European chemical industry is calling on Europe and its member states to accelerate the responsible exploration and production of indigenous shale gas. More imports of liquefied natural gas (LNG) and natural gas liquids (NGLs) will also be required as an additional source of energy and petrochemical feedstock. EU and US trade negotiations should give high priority to addressing the barriers to such trade.

Sustaining competitiveness

Today, chemistry is developing the technical capability to turn plant-based raw materials and even CO₂ into feedstocks for producing a wide range of plastics and other chemicals. But large-scale adoption of alternatives is a distant prospect, depending upon consumer preferences, biomass sustainability and commercial viability. Any incentives for the uptake of particular feedstocks must comply with European competition rules and state aid guidelines: discrimination against fossil-based feedstocks will only put the European chemical industry at a disadvantage. Europe's chemical industry can only thrive if it is nourished by affordable feedstocks, as are its rivals in other parts of the world. Petrochemical feedstocks will therefore continue to play a dominant role in the coming decades, and bringing the shale gas revolution to Europe can only strengthen their position.

¹ Cefic (2013). *European chemistry for growth—Unlocking a competitive, low carbon and energy efficient future*. European Chemical Industry Council, Brussels, April 2013. www.cefic.org/Documents/PolicyCentre/Energy-Roadmap-The%20Report-European-chemistry-for-growth.pdf