

## Crisis in the European petrochemical industry?

19 May 2013

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### In summary:

- **Ethylene**, a crucial petrochemical product for the whole plastics industry, was one and a half times as expensive in Europe as in the United States in 2012.
- The cost of ethylene production differs according to whether it is produced from naphtha (in Europe and Asia) or from gas (in North America).
- The higher ethylene price in Europe has stemmed from the rise in supply costs at European naphtha plants, whereas in Asia it has resulted from a hike in demand by plastics manufacturers.
- The (Western) European petrochemicals industry is caught between the crisis in its markets (including the auto industry) and its higher material procurement costs.

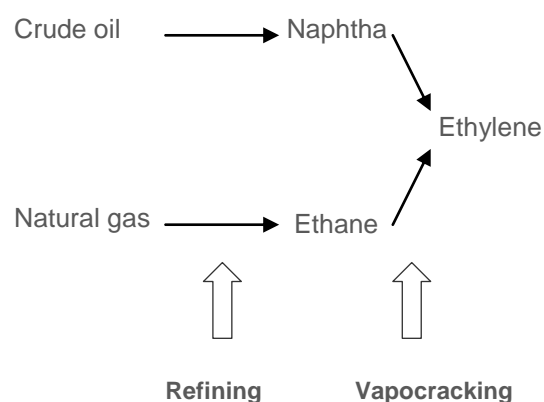
### Ethylene is produced in two different ways: from oil or from natural gas

Schematically, **Chart 1** shows that two technologies are used to produce ethylene: one from a liquid raw material, namely naphtha derived from crude oil; and one from a gas raw material, namely ethane, which itself derives from natural gas – which includes shale gas. The Middle East has a big advantage in being richly endowed with both oil and gas. It can therefore favor one or the other of these two commodities to produce ethylene, depending on their respective prices.

Because its shale gas reserves are not being developed, the West European petrochemicals industry has to pay a high price for its naphtha to manufacture ethylene. Note that 70% of its ethylene is produced from naphtha.

By contrast, the United States produces 85% of its ethylene from ethane. The abundance of the raw material required to produce ethylene in the United States keeps its procurement cost at a competitive level with regard to competition from both the Middle Eastern and West European petrochemical industries.

Chart 1: how is ethylene made?



Source: Euler Hermes

## The decoupling between European and US gas prices has become more pronounced since 2010

Chart 2 shows changes in gas prices on either side of the Atlantic. Until 2010, they evolved along markedly similar lines without any real price differential. The gap seen in the second half of 2008 and during 2009 was due to the onset of the (financial) crisis, which first hit the United States before spreading to Europe. It was in 2010 that the gap between US and European gas prices began to widen – and this is set to last. In 2012 natural gas was up to four times more expensive in Europe than in the United States. This decoupling of prices has gone hand in hand with the industrialization of shale gas extraction technologies in the United States.

To produce their ethylene, US petrochemical companies opt for very cheap, locally-extracted gas, without calling on suppliers in the Middle East. By contrast, European producers are limited to naphtha as their supply cost for gas is unable to compete with US supply.

As the US petrochemicals industry benefits from a cheap raw material cost, it is also able to sell its ethylene at a lower price. Because the European petrochemicals industry is a heavier user of naphtha, it is more dependent on oil price trends.

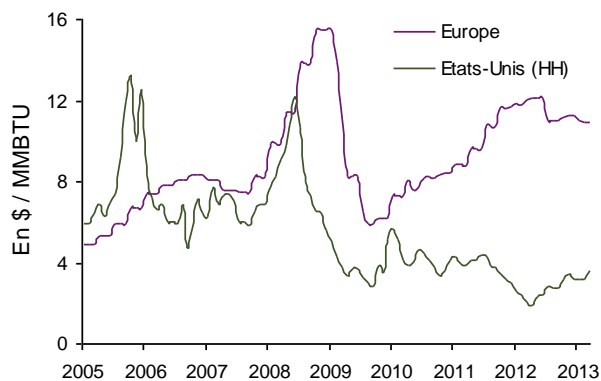
## Ethylene production volumes are tipping in favor of North America and Asia

As illustrated by Chart 3, ethylene which accounts for slightly less than half of global chemical trade volumes is the most vital raw material in the downstream plastics industry. The United States benefits from a competitive supply of ethylene and a cheaper cost of energy. Asia, on the other hand, benefits from fast-growing markets for ethylene, both in the construction and auto sectors. The Middle East, which is party to this dynamism, has been investing in new vapocacking units to fuel the growing ethylene needs of its Asian customers.

## The European petrochemical crisis can be seen in an ethylene sales price that was 1.2 times higher than in the United States in 2012

Chart 4 reflects the harsh reality, and which is unlikely to subside out to 2015. As we have seen, this price gap between Western Europe and the United States, which is nearly USD 800 per ton of ethylene, results from a particularly competitive material procurement cost in North America thanks to gas. It is one of the direct consequences of the boom in shale gas exploration and development.

Chart 2: price of natural gas (in Europe and USA)



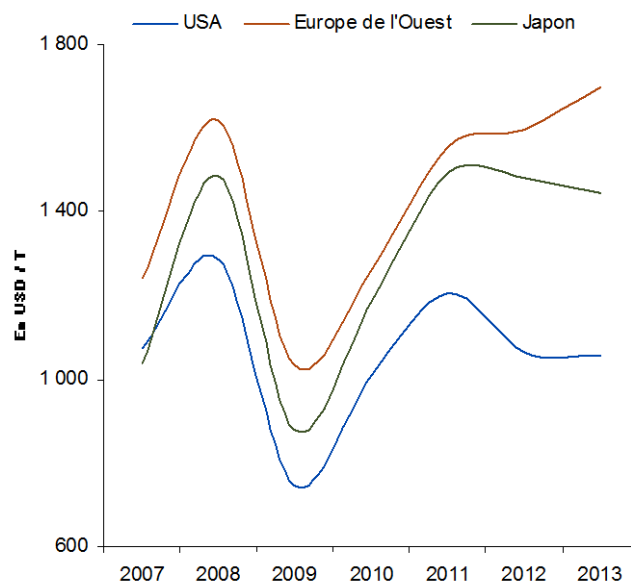
Sources: FMI, IHS Global Insight, Euler Hermes

Chart 3: top producers of ethylene (In real terms, in 2012)

Ethylene production	MoT	Share
North America	34	22%
China, South Korea	27	17%
Saudi Arabia	17	11%
Germany, Netherlands	9	6%
Japan	8	5%
Rest of world	61	39%
<b>TOTAL</b>	<b>156</b>	<b>100%</b>

Sources: ICIS, Euler Hermes

Chart 4: selling price (in US \$ / ton) of ethylene (in USA, western Europe and Japan)



Sources: Bloomberg, Euler Hermes

In addition to supply developments in other regions of the world, European ethylene manufacturers have to overcome a second stumbling block of their own: passing naphtha price hikes on to their ethylene sales prices. As shown by **Chart 5**, they have been unable to entirely pass on increases in their material purchase costs to their prices.

In 2010 for example, the price of naphtha surged 43% in Europe while that of ethylene rose by "only" 29%. It is European petrochemical producers' margins that are suffering the direct consequences, all other things being equal.

**Squeezed from both ends –raw material costs and the price of their finished product– European petrochemical producers' gross refining margin looks very volatile**

Since 2011, the drop in the gap between European naphtha and ethylene prices has resulted from the slowdown in demand for oil and, as a result, naphtha, which are highly correlated. As shown by **Chart 6**, the average gross margin, which bounced back up to €34 in 2012, remains fragile and is set to fall back to breakeven point estimated at more than €28 per ton in Europe.

Since 2010, petrochemical producers have been reducing their supply in Europe, which has resulted in closures of steam cracking facilities notably in Scotland (for Ineos) as well as in Germany (Shell) and France (Petroplus). Estimated at 5% by consulting firm Booz, excess capacity in the European petrochemical sector will persist in 2013, at around 10-12%. It is therefore highly possible that more closures of refinery and steam cracking facilities will follow out to 2015.

**The utilization rate of European refineries (in the EU sense) has not picked up since the 2009 economic crisis**

The series of shutdowns of refining capacity in Europe since 2010 has nevertheless failed to bolster units still in activity. Their utilization rate even appears to have fallen slightly since 2012, as shown by **Chart 7**, whereas at a rate below 84% their long-term profitability is not ensured. This is a consequence of the renewed competitiveness of US petrochemical producers seeking to export their new surpluses – produced and therefore sold at a low price – to Europe.

If we add to the mix the prospect of new refining and steam cracking units being launched in the Middle East out to 2015 (such as in Jubail in Saudi Arabia), there is reason to fear that the weak operating margins of (Western) European crackers might last for a few more years despite the volumes already lost as a result of recent shutdowns.

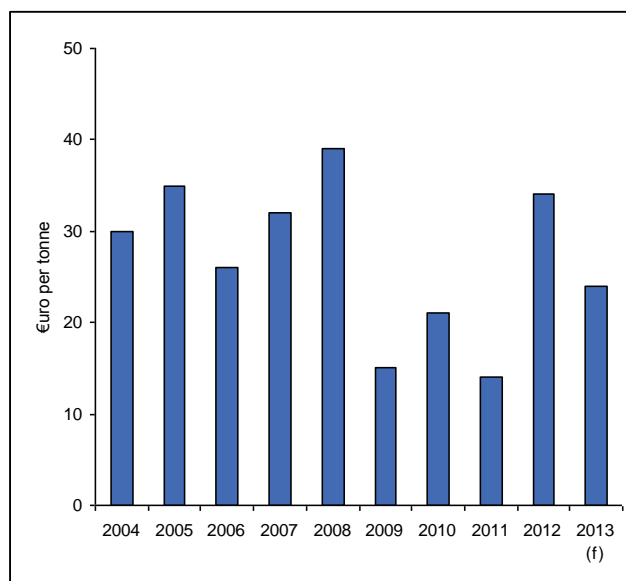
Therefore, ensuring the sustainability of European petrochemicals shall require different approaches: reduction in their energy consumption or an improvement in their technologies.

**Chart 5: yearly evolution of price (in € / Ton) of naphtha and ethylene**

Europe	2009	2010	2011	2012
naphtha	34%	43%	24%	9%
ethylene	30%	29%	20%	9%

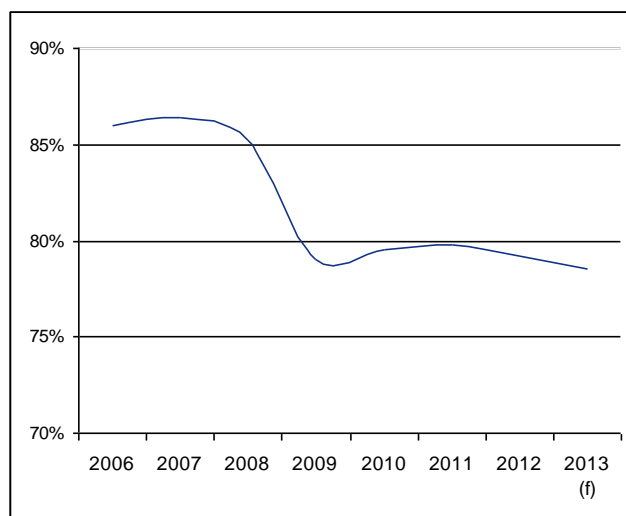
Sources: IHS Global Insight, Euler Hermes

**Chart 6: average gross margin of refining in Europe**



Sources: UFIP, estimation Euler Hermes

**Chart 7: utilization rate of refining capacities in Europe**



Sources: IFP, estimation Euler Hermes

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