

Changes leave the markets in turmoil

Adjustments to chemical feedstock supplies caused by slowing demand for refinery products, plus the switch to ethane-based cracking is causing volatility in downstream markets

PAUL HODGES INTERNATIONAL ECEM

Major changes are underway in the markets for the petrochemical “building block” products – ethylene, propylene, butadiene (BD), benzene and paraxylene (PX). These changes in relative price and availability are of vital importance to producers and a wide range of downstream chemical customers.

They are secular in nature, rather than cyclical, and are linked to the concept of the “New Normal” that I outlined here a year ago (see *ICIS Chemical Business*, September 28–October 4, 2009), and in my recent White Paper, *Budgeting for a New Normal*.

They can be summarized as follows:

- Lower growth rates for oil products such as gasoline and diesel
- Lower output from liquids-feed crackers, and higher output ex gas feed crackers.

As a result, ethylene and PX are becoming more freely available than in the past. Equally, propylene, BD and benzene are becoming more difficult to source.

HIGHER PRICES

The bottom graph on the opposite page shows the changes underway in the olefin markets. It shows how, for the first time ever, both propylene and BD are now priced higher than ethylene. This is down to two key factors:

- Ethane-based crackers are now coming online in the Middle East. This, along with the shift to lighter feeds in the US and Europe, is reducing operating rates for liquids-based crackers. These are major sources of propylene and BD, as well as benzene. And so the volume of these “co-products” is reducing.
- Separately, declining gasoline demand in Europe and the US, caused by the shift to diesel in Europe, and the higher use of ethanol in the US, is reducing refinery operating rates. Refinery volumes are an order of magnitude larger than chemical volumes. And so in turn, this is also reducing propylene and benzene production.

This combination has created a counter-intuitive result. During a downturn, one would expect petchem supply/demand balances to weaken. But during the first half of the year, overall supply of feedstocks reduced ahead of demand. Even the growing surplus of ethylene in the Middle East and Asia was mitigated by lower liquids-feed availability from refineries.

The most extreme example of this factor at work has been BD. Its markets became extremely tight, in spite of lower auto sales, because of its lack of alternative production routes. The change in propylene values, rela-

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tive to ethylene, has also been quite dramatic. Propylene was still regarded as a disposal problem by many cracker operators 30 years ago, and its price was only around 60% of the ethylene price. This value leakage led producers to successfully focus development effort on propylene derivatives, particularly polypropylene (PP).

During the 1980s, propylene’s relative price improved so it normally sold at between 70–85% of the ethylene price. And five years ago, its relative price increased again. This was a result of tight ethylene and benzene markets, which prompted some converters to seek alternatives to polyethylene (PE) and polystyrene (PS). In turn, this helped propylene’s growth rate move to 1.2 times global GDP, versus the 1.0 times level of ethylene.

BIG QUESTIONS

This year, we have seen propylene move to parity pricing with ethylene, raising important questions for producers and consumers:

- Should producers invest in more on-purpose production, such as metathesis and propane dehydrogenation, in addition to

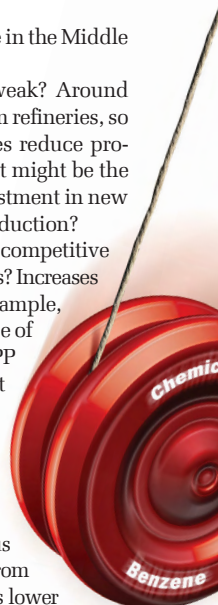
the plants now coming online in the Middle East and Asia?

- Will refining rates remain weak? Around 30% of propylene comes from refineries, so lower refinery operating rates reduce propylene supply. Equally, what might be the impact of China’s heavy investment in new refinery-based propylene production?
- Can propylene derivatives be competitive at today’s higher relative prices? Increases in US auto efficiency, for example, will force a reduction in the use of steel and glass. So perhaps PP and polycarbonate (PC) won’t need to be price-sensitive in such applications?
- Can converters afford to change their machinery to use less propylene? The new polymer parks in the Middle East focus on PE as the main product from local crackers. But with today’s lower margins, can PP users justify a switch?
- Will ethylene’s lower price, relative to propylene, raise its growth rate at propylene’s expense?

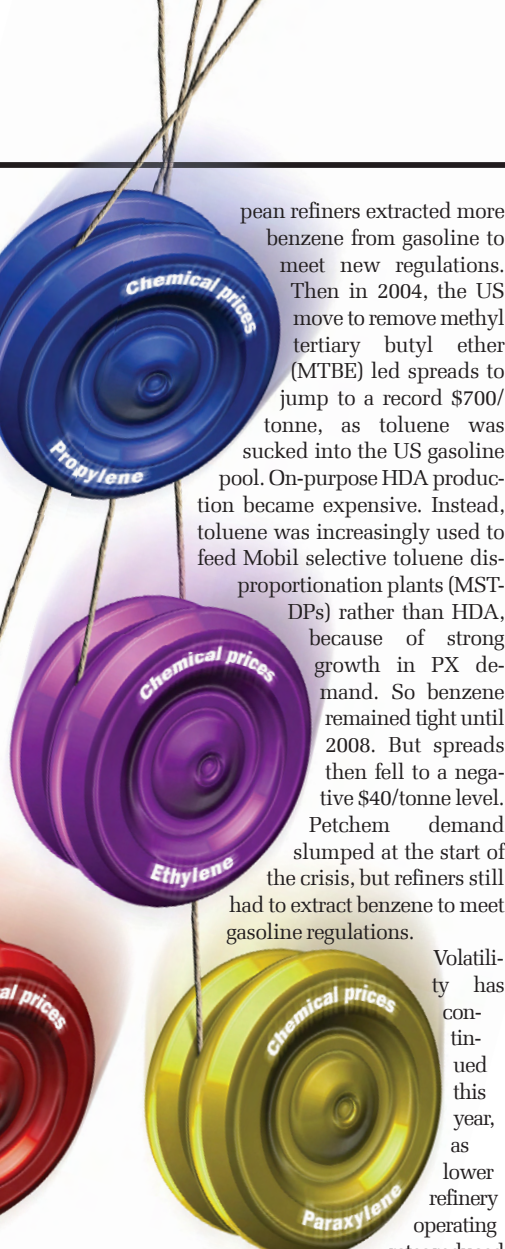
CHANGES IN THE MARKETS

Clearly, this is an unprecedented situation for olefin markets, and we have no guide from history as to how these issues will resolve themselves. It is matched by the changes taking place in the markets for the major aromatics, benzene and PX.

The top left graph on page 33 shows benzene’s spread versus naphtha, the key dynamic from a price and margin perspective. This was normally in the \$80–200/tonne range until the early 2000s. This was because considerable on-purpose capacity existed in the form of HDA (hydrodealkylation) units. When toluene’s price fell, or benzene’s rose, these units stabilized supply/demand balances. But since then, refining dynamics have increasingly come to dominate benzene markets. In 2000–2001, they forced benzene into surplus, and the spread dipped close to zero, as Euro-



Graphic: J. Burgess



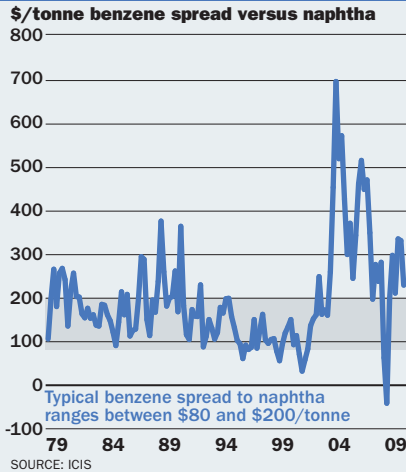
pean refiners extracted more benzene from gasoline to meet new regulations. Then in 2004, the US move to remove methyl tertiary butyl ether (MTBE) led spreads to jump to a record \$700/tonne, as toluene was sucked into the US gasoline pool. On-purpose HDA production became expensive. Instead, toluene was increasingly used to feed Mobil selective toluene disproportionation plants (MSTDPs) rather than HDA, because of strong growth in PX demand. So benzene remained tight until 2008. But spreads then fell to a negative \$40/tonne level. Petchem demand slumped at the start of the crisis, but refiners still had to extract benzene to meet gasoline regulations.

Volatility has continued this year, as lower refinery operating rates reduced benzene supply, while demand was supported by government stimulus programs. Spreads jumped again, to \$300/tonne. And this increased volatility raises a serious issue for buyers, as it indicates that there is really little flexibility for benzene supply to balance demand.

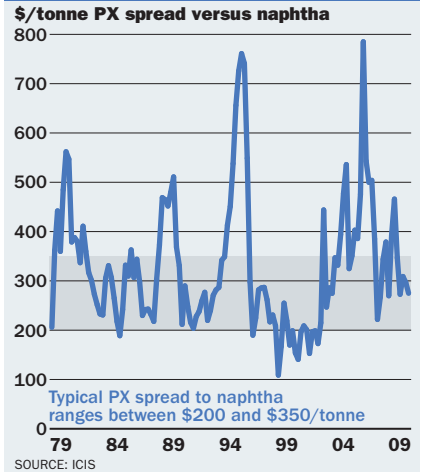
When benzene demand is low, they benefit from lower spreads. But as with propylene and BD, when demand improves, there is no automatic increase in supply.

The top right graph looks at PX pricing spreads. Their volatility seems instead to be reducing. For the past 30 years, PX demand has grown strongly, via purified terephthalic acid (PTA) and polyethylene terephthalate (PET), even though it required xylene (or toluene for MSTDP), to be "bid away" from gasoline and the octane pool. This was often difficult, as refiners would never allow gasoline stations to run short, whatever the alternative value into PX. More recently, however, markets seem to be moving in favor of PX consumers, with the spread more often in the range of \$200-\$350/tonne. Lower Western octane demand should

EUROPEAN BENZENE SPREADS INCREASINGLY VOLATILE

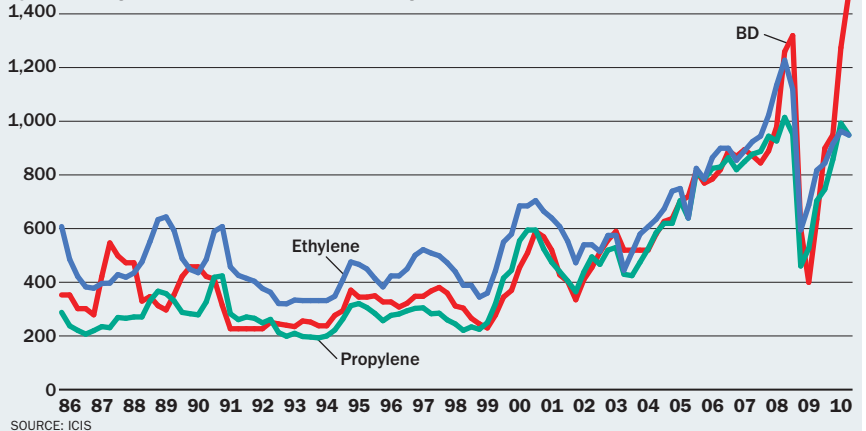


EUROPEAN PX VOLATILITY IS DECREASING



FOR THE FIRST TIME, EUROPEAN PROPYLENE AND BD COST MORE THAN ETHYLENE

€/tonne ethylene contract price versus propylene and BD



lead to improved toluene and xylene availability. PX may finally develop a genuine supply/demand balance of its own, only partially related to gasoline.

MAJOR CHANGES

2010 has seen major changes taking place in the price and availability of the main petrochemical "building block" products. These changes are being driven by the wider changes taking place in the economy and society.

Westerners born between 1946 and 1964 are starting to retire. They have led the surge in demand that has driven petrochemical growth rates since 1980. But now they are starting to prioritize saving, rather than spending. While domestic demand in the emerging economies may well continue to grow at higher rates, its impact on global demand will be relatively small by comparison, because of the much lower GDP per capita of these countries.

A transition of this magnitude is going to present challenges to producers and consum-

ers, particularly as we have become used to straight upward-line growth over the past 15 years. It will no doubt take time for its full impact to become apparent.

Temporary reversals back to the previous status quo are almost certain, making firm forecasts even more difficult.

Prudent producers and consumers might therefore want to develop a scenario-based approach to future planning, that includes further development of the analysis set out here. ■

Paul Hodges is chairman of International eChem, www.iec.eu.com, a trusted adviser to the chemical industry and its investment community. He writes the ICIS Chemicals and the Economy blog, and recently published the White Paper *Budgeting for a New Normal*.

