

SPECIAL REPORT: PETROCHEMICALS

US benzene: The search for a new normal

As prices rebound from six-year lows, a key question lingers in the market: Will oil prices dictate benzene behavior, or will fundamentals have the last say?

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WEAK BENZENE PRICES, OIL AND MARKET FUNDAMENTALS

Less than three years since first surpassing the \$5/gallon (\$1,495/mt) mark and two years since participants began to ponder whether they were witnessing a “new normal,” US benzene prices head into the second half of 2015 averaging their lowest levels since at least 2009.

Five dollars as the new normal? Try half of that – or possibly lower – if current fundamentals persist.

Market insiders need not look far in search of the reason for this extraordinary shift in pricing behavior.

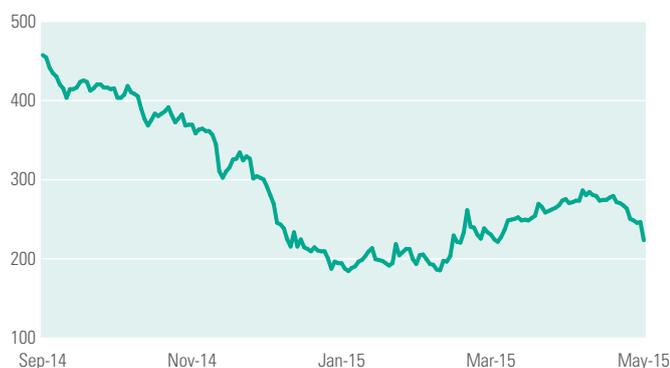
Driven by plummeting oil prices over the second half of 2014, US benzene prices shed nearly 65% over the period, hitting a near-six year low of 191 cents/gal in January.

And even as oil has shown moderate rebounds since and global benzene prices tracked higher in Q2 – US spot pricing closed the quarter at 296 cents/gal for a 35% increase – the gains have been limited by improved product availability from Asia into the net-short US.

For the two years ending in September 2014, US spot benzene prices averaged \$4.54/gal FOB US Gulf Coast, with the highest price at \$5.53/gal on January 15, 2014 and the lowest price at \$3.92/gal on October 22, 2012, based on Platts data. Much of the price volatility was due to fundamentals – whether US benzene imports were sufficient to satisfy demand – but also had to do with crude pricing hovering in the \$80-\$110/barrel range.

During much of the same period, US spot styrene prices were consistently in the 60s and 70s cents/lb FOB USG throughout 2012 and 2013 and for the first 10 months of 2014 before falling at the end of the year. In 2013, spot styrene margins were healthy and the market was active, but in 2012 and 2014, higher feedstock benzene prices crushed margins and arbitrage opportunities and slowed styrene activity.

Benzene decline (¢/gal)



Source: Platts

Conditions in the first half of 2015 resembled those seen in 2013, as lower benzene prices have supported a stronger styrene market and healthy margins. The US is a net exporter of styrene, so the attractive arbitrage has been a welcome relief to sellers and traders.

During the fourth quarter of 2014, US benzene prices saw a steep decline in pricing, resulting in a much larger drop than what is generally seen and attributable to typical levels of volatility.

The falling benzene prices were attributed to the more than 50% drop in crude and large volumes of benzene that arrived into the US from Asia during that time. The imports arrived despite slow US demand in key derivative styrene and phenol markets, adding additional downward price pressure.

In 2015, US prices have treaded in territory not seen since 2009. Market sentiment has been a rollercoaster since the decline, and a common observation among participants is that just when the benzene market starts to seem predictable, market conditions shift and volatility returns.

The late- 2014 decline was the largest drop ever seen in US benzene pricing over a four-month period, as prices tumbled as much as 59%, or \$2.73/gal, from the beginning of September, based on Platts data. The drop in benzene prices coincided with falling crude prices. Though the US benzene market tends to be driven by supply balances because of its net-short position, crude pricing plays a major role. As crude prices fell to near six-year lows, US benzene prices followed suit.

The benzene-to-crude ratio is considered by many market players to be an effective tool in determining the value of the aromatic. A higher ratio can be interpreted as an indication that benzene prices are too high and could move lower depending on fundamentals; a lower ratio could mean the opposite. In a bearish market, US benzene is more correlated with crude movement and in a bullish market, there's more of a disconnect, sources said.

The benzene-to-crude ratio has averaged 1.85 since May of 2009, which is close to the typically accepted average of 1.80 in the market. Market participants start to expect a price correction in the market the higher or lower the ratio gets beyond this point.

During that period, the ratio peaked at 2.56 on July 13, 2012 and was at its lowest point at 1.27 on November 30, 2011.

ASIA ARBITRAGE LEADS TO OVERSUPPLY

At the end of 2014, US derivative demand was slow, while Asian benzene inventories were in excess. An open arbitrage window to the US from Asia is typical, and helps the US in balancing the supply deficit to satisfy demand, but the end of 2014 was a different story. Even during shorter periods when arbitrage economics for Asia to send benzene to the US were unattractive, the US was still a popular destination for product.

Arbitrage opportunities for Asia to send benzene to the US were available off and on during the fourth quarter of 2014, but prior to that, opportunities for Asia to send benzene into the US were most attractive mid-June through August of 2014. In November and December, the arbitrage window from Asia to the US was mostly closed on paper, but exports to the US continued because of benzene oversupply in that region.

The highest spread between FOB Korea and US pricing was \$104.31/mt on December 17, but a day later the spread fell to \$22.43/mt. The US typically needs around 120,000 metric tons monthly to satisfy the production deficit, however slow demand meant the US did not need as much supply as usual to satisfy the shortage.

At least 300,000 tons of benzene arrived from Asia during November and December, which was more than the US needed during that period of slow demand, according to market participants.

The additional benzene resulted in excess inventories in the US market. After December 19, the arbitrage window closed and has remained closed during the first half of 2015, resulting in lower-than-typical benzene shipments from Asia since February. The average shipment since has been in the 40,000-70,000 metric ton range, when the usual import amount needed to satisfy the US production deficit is at least 100,000 metric tons per month, sources said.

In February and the beginning of March, an atypical arbitrage flow opportunity opened with the US exporting benzene to Asia. Market sources described this event as a “reverse arbitrage.”

Despite an unattractive arbitrage window from Asia during the first half of 2015, the US market has continuously struggled to absorb the excess supply even though downstream styrene demand has been considered strong by market participants since March.

In the longer term, Asia is expected to have more benzene to send to the US because of new capacities coming online during 2015-2017. Around 1.4 million metric tons of new capacity is scheduled to come online during this period, with 700,000 metric tons of that new capacity expected to begin production in 2015. While some of this benzene will be used to satisfy phenol demand from added downstream phenol capacity in Asia, there will still be excess supply.

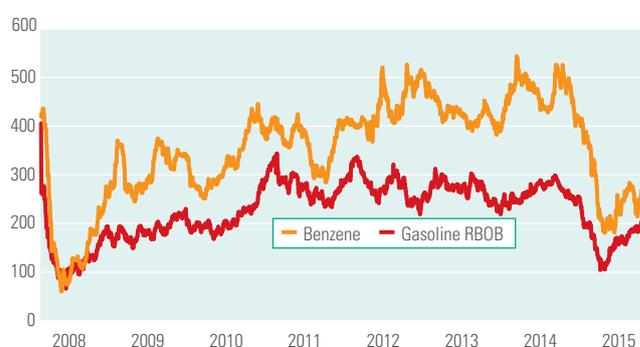
The new benzene capacity is expected to add to the surplus of benzene already seen in the Asian market, and the material will have to have a destination. “The primary outlet [for the Asian benzene] will be the US,” a source said. With this being said, market participants looked at the possibility of \$6/gal benzene as a new normal during periods tight supply, despite this new capacity coming online in Asia, because the shift to shale gas has meant cracking lighter feedstocks, which ultimately will lead to less benzene supply, leaving the US more dependent on Asian imports.

Toluene – benzene spread (¢/gal)



Source: Platts

Benzene vs RBOB prices (¢/gal)



Source: Platts

ABNORMAL MARKET CAUSES UNUSUAL SPREADS, MARGINS

Market conditions have been turned on their head during the first half of 2015, according to market participants. The US has not needed typical levels of imported benzene from other regions to balance the structural deficit as demand has not been strong enough to absorb that level of imports, the toluene-benzene spread has been in negative territory and the benzene-RBOB gasoline spread narrowed to a 6 year low of 22.83 cents on February 23, 2015, Platts data showed. Spot benzene prices are usually at a premium to spot toluene prices, but toluene has been at a premium thus far in 2015 because of strong gasoline blending demand and tight supply as refineries have refrained from extracting toluene because of poor extraction economics, sources said.

Between 2012-2014 the toluene-benzene spread averaged 57 cents/gal ,or \$152/mt. From the beginning of 2015, the average has been around negative 3 cents/gal or negative \$21/mt. When the toluene-benzene spread is narrow or in negative territory, production economics for using toluene as a feedstock to produce benzene are unattractive.

Hydrodealkylation, toluene disproportionation and Mobil selective toluene disproportionation margins, which provide indication of whether or not it is profitable to produce benzene from toluene, have been negative for most of 2015 thus far, meaning production units

have been operating at minimal rates or not operating at all, per market feedback. These margins are expected to improve and move back into positive territory later in the year on tightening benzene supply later in the year. Benzene supply is expected to tighten as a result of lower Asia imports and negative production economics via toluene as a feedstock, ultimately putting upward pressure on spot prices late in the third quarter or the beginning of the fourth quarter, sources said.

The benzene-RBOB gasoline spread averaged around \$1.63/gal from 2012-2014, but has averaged less than half that size during the first half of 2015, hovering around 63 cents/gal. Many market participants consider this average to be low, and expect the average spread to be wider during the second half of 2015 amid expectations of higher benzene prices.

There have been times during the first half of 2015 when the benzene market has been more bullish as a result of fewer Asian imports and negative production economics from the use of toluene as a feedstock, but this sentiment has been in the shadow of a continually oversupplied market. Attractive arbitrage opportunities in the derivative styrene market coupled with a wide styrene-benzene price spread, which indicates strong profit margins for styrene, have caused the benzene market to gradually become more bullish, sources said.

TIGHT SUPPLY, STRONG MARGINS SUPPORT STYRENE

Looking downstream to styrene, the US spot market has remained active since the start of the year as arbitrage windows to Europe and Asia and steady to strong demand downstream in polystyrene and acrylonitrile-butadiene-styrene have lent support to pricing. Improved styrene demand translated into stronger demand upstream for the US benzene market earlier in the year. However, the improved downstream demand did little to utilize excess supply in benzene due to the volume of imported benzene from Asia throughout the fourth quarter and the first quarter, but it did help – at least temporarily – lift pricing in the benzene market higher.

US spot styrene supply has been tight for most of the period since March 2015 as spot sales to Europe and Asia months in advance have made prompt product difficult to find. Sellers have been arranging for

NWE styrene – benzene spread (\$/mt)



Source: Platts

sales of product at least a month or two in advance as the styrene arbitrage has been expected to remain open through August 2015, sources said. In addition, planned and unplanned outages globally have resulted in a tighter global supply situation, sources in Europe, Asia and the US have said.

The arbitrage to Asia opened in mid-January, with as much as 100,000 mt of styrene headed to the Far East out of the US, market sources said. The arbitrage window to Europe opened soon after, and the attention of US sellers shifted from Asia to Europe as the landing spot for the majority of the product exported between March 2015 and May 2015 due to soaring European spot prices. Between February 16 and March 24, second month European styrene spot prices rose \$510/mt to an assessment at \$1,455/mt FOB Rotterdam, according to Platts data. Europe presented the more attractive arbitrage.

The US market was still tight early in the second quarter as LyondellBasell took one of its two propylene oxide-styrene monomer plants down in late April. The unit restarted in June, sources said, and the company declined comment on the facility’s operational status the week of June 22, 2015. Cos-Mar, a joint venture between Total and Sabic, had a line down for maintenance starting at the end of May and restarted in late June, sources said. Confirmation from the company was unavailable. Between those two plants, about 10% of total US capacity has been offline during the second quarter, a situation that has continued to keep US spot supply tight.

This situation resulted in styrene spot prices moving up about 71% between January and May, Platts data showed. US styrene spot prices, which had been at a 6 ½-year low of 36 cents/lb FOB USG on January 15, climbed to 61.50 cents/lb FOB USG on May 18, according to Platts data. US spot prices climbed on tight supply in the US and tracking the higher spot prices in Europe and Asia as the arbitrage opportunities to both regions have remained open, sources said.

In Asia and Europe, styrene spot pricing jumped above \$1,400/mt in late April, Platts data showed. US prices climbed along with both regions, tracking the arbitrage from the middle of January through the end of May. However, in the last month, Asian and European spot pricing has declined as turnarounds in those regions have ended and spot imports from the US have arrived. Due to this, US spot pricing has also dropped into the mid-50s cents/lb FOB USG.

US spot supply has continued to remain tight and was expected to remain tight at least through July as very little supply was available, sources said. Sellers continued to sell months in advance and there continued to be interest for prompt product and for product 45-60 days in advance due to the healthy arbitrage opportunities that remained despite the falling prices, sources said.

STYRENE-BENZENE SPREAD SOARS IN NWE, US

Higher spot prices in the US have led to the spread between styrene and benzene ballooning. Supply tightness in global styrene monomer

Styrene FOB USG (\$/mt)

Source: Platts

US styrene – benzene spread (\$/mt)

Source: Platts

markets has spurred a wide spread between styrene and upstream benzene prices, industry sources said.

In the US, the spread dropped below \$500/mt in June. At the same point last year, the spread was \$289.18/mt, Platts data showed. The styrene-benzene spread peaked at \$650/mt on May 26, based on Platts data.

Because of the healthy spread, sources said margins on spot deals out of the US were strong, with a trader adding that spot margins could have been as high as \$450/mt. With cheaper feedstocks benzene and ethylene, variable costs for styrene during much of the second quarter were estimated by Platts at 36-40 cents/lb (\$794-\$882/mt) and spot sales have been done as high as 20.5 cents/lb (\$452/mt) above variable cost estimates.

CURRENT FUNDAMENTALS COULD LEAD TO HIGHER PRICES

The steep fall in crude and large volumes of benzene from Asia coupled with slow derivative demand during the fourth quarter resulted in atypical market dynamics – the opening of the reverse arbitrage, a consistently negative toluene-benzene spread, which translates into negative HDA, TDP and MSTDP margins, and a three-year low benzene-RBOB spread. Though lower US benzene spot levels have hovered in the \$2/gal range, this has not shifted overall expectations benzene prices will again reach higher price levels that the market had grown accustomed to seeing.

The upward trend in pricing is expected to be gradual and depend on the recovery of crude prices and supply dynamics, according to market participants. In the short term, benzene supply is expected by market players to tighten and put upward pressure on US pricing. Sources expect limited supply to keep US benzene pricing volatile in the short term.

A combination of strong styrene demand amid open arbitrages and healthy styrene to benzene margins coupled with tighter supply expectations because of negative benzene production economics via TDP, MSTDP and HDA units, and fewer imports

from Asia are all reasons for bullish sentiment in the market, sources said. The same factors have been contributed to spikes in benzene prices throughout the first half of 2015, but higher inventories prior to June had the potential to dampen bullish pricing, sources said.

In the longer term, price volatility in the US could be curtailed by new benzene capacities coming online in Asia, which will result in more benzene supply Asia can send to the US. This will ultimately minimize periods of tight supply in the US, sources said. The US will continue to be a net-importer of benzene with no major production expansions on the horizon.

STYRENE EXPECTED TO REMAIN TIGHT, FOLLOW ARBITRAGE OPPORTUNITIES

US spot styrene prices are expected to continue follow global price trends as the arbitrage opportunities to Europe and Asia remain open, sources said. US spot supply is also expected to remain tight due to the selling in advance that we have seen over the first half of the year.

If benzene prices continue to climb, then the floor for spot styrene prices will be around the variable costs level, sources have said. A healthy margin on styrene spot sales is at least 3-5 cents/lb. As variable costs rise and styrene spot prices come off, there will be a point where producers begin to lower production rates and the market could slow down, sources said.

However, more US turnarounds later in the third quarter or starting in the fourth quarter could limit the decline in spot styrene prices as that would also keep styrene supply limited, a source said. Inventory levels in China remained low – around 32,000 mt in mid-June, according to Platts data - and could entice more exports out of the US to that region and support US spot prices, the source added. There were some market participants who were bearish on US styrene, at least in the short term, as supply remained hard to find and spot prices in both Asia and Europe continued to trend lower. If Europe and Asia continued to fall, expectations were for the US to follow, sources said.

WHAT'S HAPPENING IN REGIONAL AROMATICS MARKETS? AND HOW IS IT AFFECTING GLOBAL SUPPLY AND DEMAND?

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