

Argus Olefins Outlook

Formerly Argus DeWitt Olefins Outlook

Ethylene

Asian ethylene prices are expected to recover on production cuts and unplanned supply issues. In Europe, high feedstock and utility costs squeeze margins. US prices continue to slowly moderate as the turnaround season proceeds.

Propylene

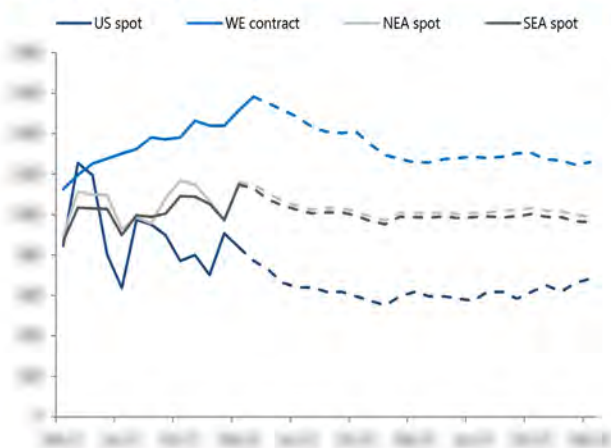
Near-term Asian propylene prices rise as supply tightens on unplanned supply shutdowns. Europe's market balance is softening as more imports arrive. Planned turnarounds and unplanned shutdowns in the US are driving higher spot propylene prices as energy commodity prices rise.

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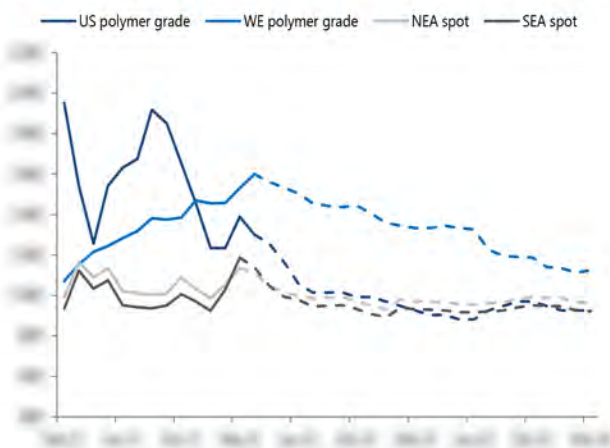
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Regional ethylene prices \$/t



Regional propylene prices \$/t



What's Changed

- Low availability and hindered shipping are delaying price movements, and could delay global margin declines more than forecast.
- Higher crude prices have pushed up prices and forecasts for most products in the ethylene value chain in all regions.
- In Asia, unplanned maintenance in northeast Asia strengthens ethylene and derivative prices earlier than forecast.
- In the US, propylene producers experienced more production losses than expected from planned turnarounds.

Chemicals
illuminating the markets

Price forecast

US																										
	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Jul 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	
Contract ethylene US $\text{\$/lb}$	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1	42.1
Contract ethylene $\text{\$/t}$	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928	928
Spot ethylene US $\text{\$/lb}$	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0
Spot ethylene US $\text{\$/t}$	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838	838
Poly Gr contract propylene $\text{\$/lb}$	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
Poly Gr contract propylene $\text{\$/t}$	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389	1,389
Poly Gr spot propylene $\text{\$/lb}$	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5	60.5
Poly Gr spot propylene $\text{\$/t}$	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334	1,334
Ref Gr propylene US $\text{\$/lb}$	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Ref Gr propylene $\text{\$/t}$	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529
HDPE IM fas Houston bagged $\text{\$/lb}$	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0
HDPE Film fas Houston bagged $\text{\$/lb}$	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5	58.5
LLDPE butene fas Houston bagged $\text{\$/lb}$	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0	68.0
LDPE Liner fas Houston bagged $\text{\$/lb}$	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
PVC Pipe fas Houston bagged $\text{\$/lb}$	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5	70.5
PP homo $\text{\$/lb}$	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0

Europe																										
	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Jul 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	
Contract ethylene $\text{\$/t}$	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514	1,514
Contract ethylene $\text{\$/t}$	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340
Poly Gr contract propylene $\text{\$/t}$	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531	1,531
Poly Gr contract propylene $\text{\$/t}$	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355	1,355
HDPE blow moulding $\text{\$/t}$	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750	1,750
LLDPE $\text{\$/t}$	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985
LDPE $\text{\$/t}$	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375	2,375
PVC pipe $\text{\$/t}$	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810	1,810
PP homo $\text{\$/t}$	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100

Table does not give prices for periods currently in negotiation.

Price forecast

Asia-Pacific																										
	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Apr 23	May 23	Jun 23	Jul 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	
NEA spot ethylene \$/t	1,157	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155
SEA spot ethylene \$/t	1,147	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145
NEA spot propylene \$/t	1,137	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135	1,135
SEA spot propylene \$/t	1,187	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185
HDPE Film \$/t	1,207	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205
HDPE IM \$/t	1,097	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095	1,095
LLDPE \$/t	1,207	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205
LDPE \$/t	1,537	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535
PVC pipe \$/t	1,297	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295	1,295
PP raffia \$/t	1,167	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165

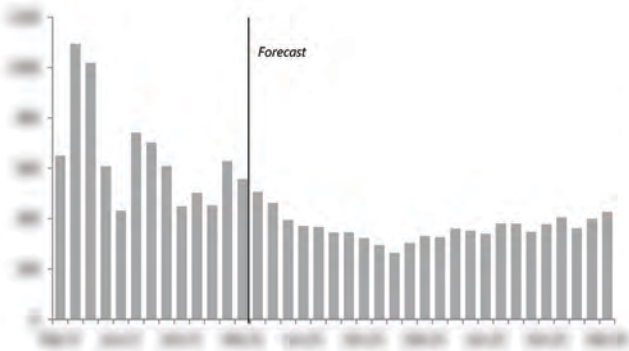
Market assumptions																										
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Crude WTI \$/bl	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
North Sea Dated \$/bl	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93
Dubai \$/bl	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
Natural gas Henry Hub \$/mmBtu	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13	4.13
Naphtha ARA \$/t	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825	825
Naphtha cfr Japan \$/t	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827
Exchange rate assumption \$/€	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13

Table does not give prices for periods currently in negotiation.

Ethylene feedstocks

US ethylene spread to ethane

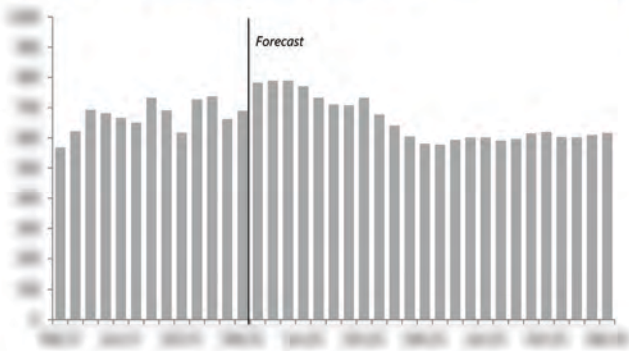
\$/t



During a large event, ethylene-ethane spreads probably peaked in January for the year, and are expected to steady down on average for the balance of the year. Spreads will narrow around mostly in the \$25-\$35 range for the balance of the forecast.

Europe ethylene spread to naphtha

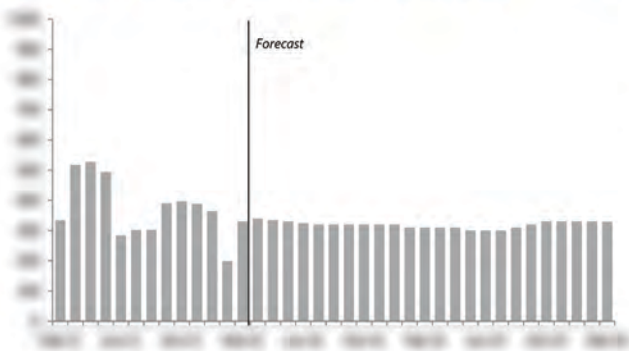
\$/t



The ethylene market remains balanced to firm with the ongoing consequences of unplanned shutdowns at the start of the year. Production was already reduced in response to high gas and utility costs, with no flexibility to cover an already supply constrained. Significant volumes of ethane are expected to be being cracked, leading to competition at some points. The firm balance is set to continue through the first quarter. Higher energy costs and preparations for a spring maintenance season support stronger near term margins in ethylene derivatives. Oil and P&E demand remains good, supported by the lack of imports and high freight rates. We see the spreading will rise 2022. Therefore, the arrival of imports and subsequent weak derivative balances should put pressure on differentials, forcing them downwards. For a continued strong ethylene balance will set a strong floor that limits downward, especially considering a strong maintenance program in the spring and the limited operations of new steam crackers in 2022.

Northeast Asia ethylene spread to naphtha

\$/t

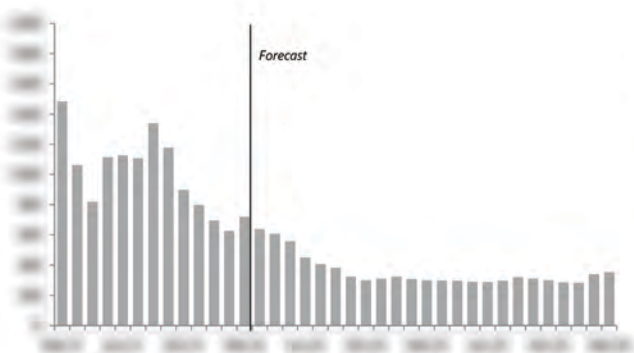


High feedstock prices from crude gains continue to push large petrochemical margins in Asia, with most crackers in Asia limiting operating rates, reducing supply availability. As crackers ramp up production for manufacturing's peak demand period, the current reduced operating rates are expected to tighten margins and create a shortage pressure as demand increases and supply dips. In the spread between ethylene and naphtha is expected to remain firm in the near term, and then narrow as crackers in Asia ramp up operating rates. In the longer term, the margin is forecast to narrow as wider ethylene derivatives. Ethylene will continue to see tighter margins with the influx of additional ethylene supplies from the US and the start-up of large petrochemical complexes in China.

Propylene feedstocks

US propylene spread to propane

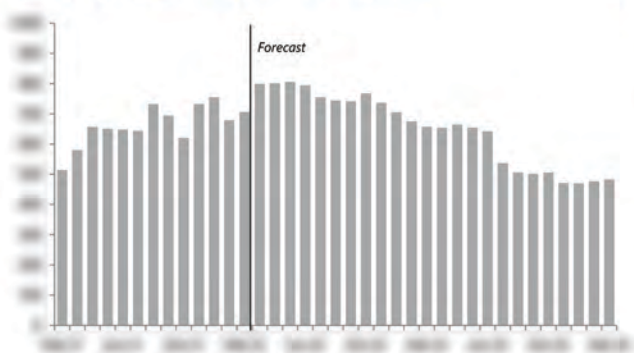
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We continue to forecast a lower propylene propane spread for the US. Propylene prices are expected to decline at a faster pace than propane prices over the balance of the year, with the spread heading out to low third quarter or early fourth quarter 2022. The cause is that macroeconomic factors can impact these prices independently, particularly if interregional arbitrage windows open for more exports from the US. We have seen that to an extent with propylene recently and it could become a bigger issue, particularly if there is a shift in the tight but balanced European propylene market.

Europe propylene spread to naphtha

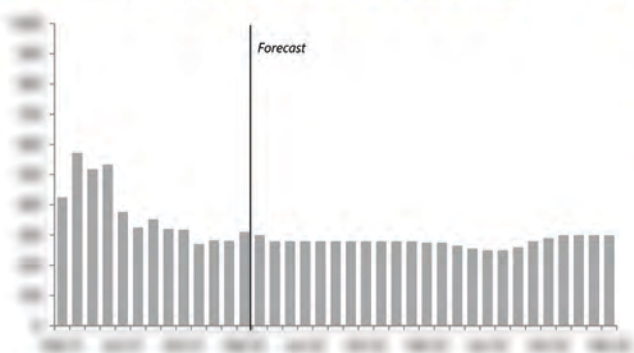
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As with ethylene, unplanned supply disruptions at crackers and refineries tightened the near term domestic propylene balance, with imports helping to improve the balance. Imports continue to be required to supplement domestic supply and, with planned maintenance at two European PSM facilities, the need for further deep sea imports will continue to provide support to European values. Domestically, we expect propylene spreads to ease back as new third capacity expansions are commissioned and domestic exports regain competitive costs to compete. As with ethylene, we anticipate that declines in propylene spreads will take longer and be lower than in our earlier forecasts due to the improved competitiveness of the European cost base and the need to support structural exports until mid 2023, when a new European PSM unit is commissioned.

Northeast Asia propylene spread to naphtha

\$/t

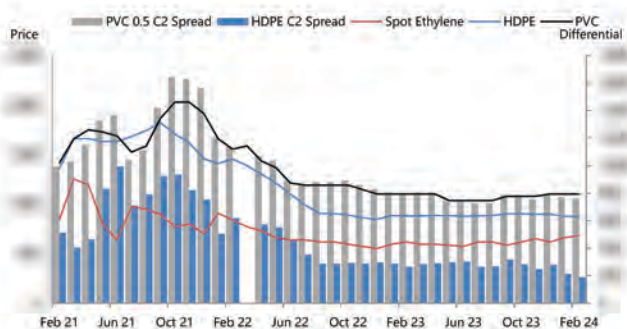


Asian propylene margins ease from the weakness at the end of 2021, supported by ongoing supply shortages and an unplanned shutdown following a feed explosion at South Korea. Overall, about the extent of the credit remains limited supplies in China because of harmonized among major PSM producers are also causing upside to propylene prices. In the medium term, the propylene spread is forecast to weaken as the major Chinese PSM units return to normal operations after planned turnarounds at the start of the year. In the longer term, the rise in ethylene and PSM production across Asia is expected to offset propylene economics in the region. These new capacities, which are tightly integrated with PE units, will encourage polymer substitution with other PE grades.

Regional polymer spread

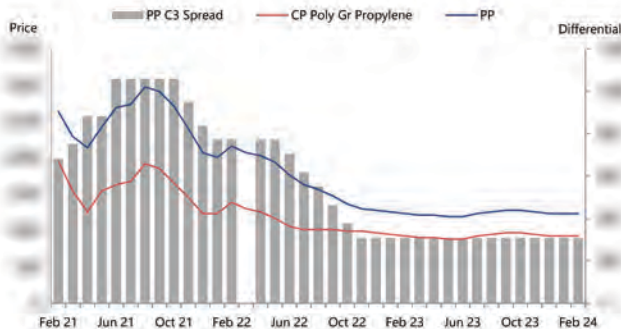
US HDPE and PVC spread to C2

\$/t



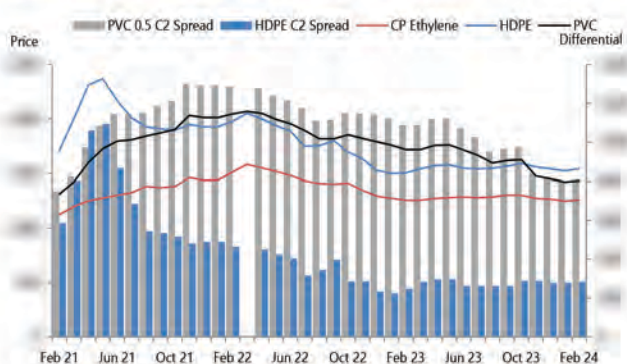
US polypropylene spread to propylene

\$/t



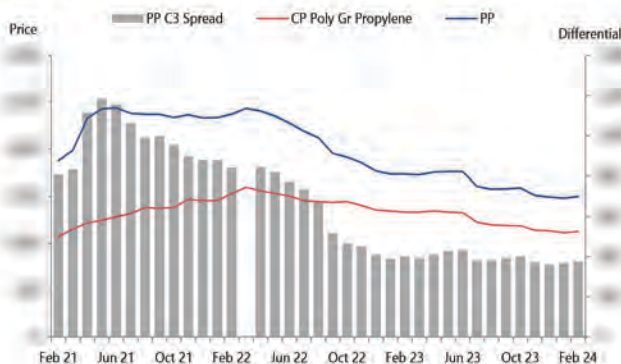
Europe HDPE and PVC spread to ethylene

\$/t



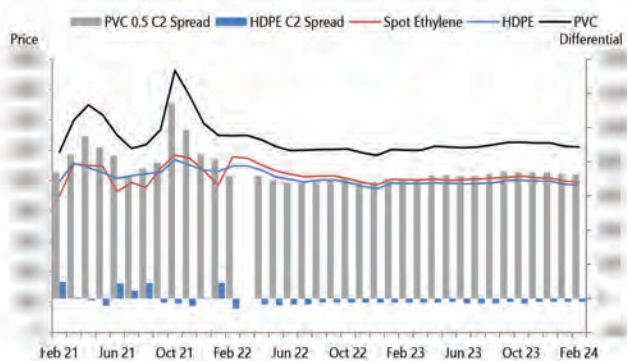
Europe polypropylene spread to propylene

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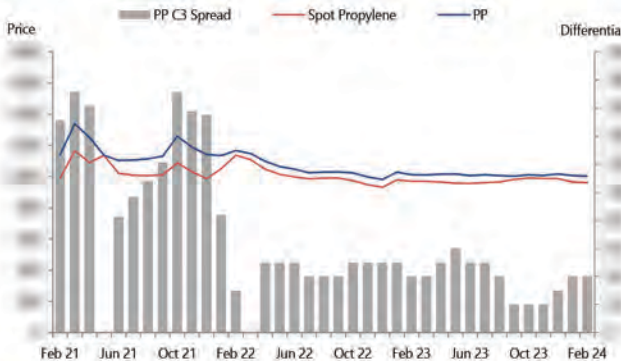
Northeast Asia HDPE and PVC spread to ethylene

\$/t



Northeast Asia polypropylene spread to propylene

\$/t



Global crude and feedstocks

Argus forecasts

Argus expects crude to average \$55-\$58/bbl for February then rising to the \$55-\$58 range by the fourth quarter. A bullish crude outlook is supported by rising tensions in Ukraine, incredibly tight global crude stocks, lower output of the lower third sector, Opec+ struggling to raise output, and potential problems in Kazakhstan, the Middle East and north Africa. Bearish impacts include Iran negotiation success, steady weakening of demand growth, higher interest rates, weakening gross domestic product (GDP) forecasts, and Chinese demand growth fading events, amid increased restrictions. We see bullish momentum into early spring and summer, then turning towards equilibrium into September.

Market sentiment is building that Opec+ will struggle to keep up with rebounding oil demand, with spare capacity dropping to 2.8bn bbl at the end of March to as little as 2.6bn bbl by the end of September. We continue to show a weaker price profile in anticipation of more oil in global supply. Overall, global oil demand recovery post-Covid continues to support crude prices.

After seeing North Sea Dated (NSD) rise as high as \$100 in late January, it has continued to rise to \$100 in the week ending 11 February. We now see NSD averaging \$100 in 2022. We revised the annual average for 2021 and 2022 upwards by \$5/bbl to \$75/bbl and \$75/bbl, respectively. Global demand will continue to recover through 2022. We forecast demand growth of 1.7bn bbl, mainly on the lower impact of

the lower third sector restrictions and Opec+ continuing to fail to achieve its targeted production increases.

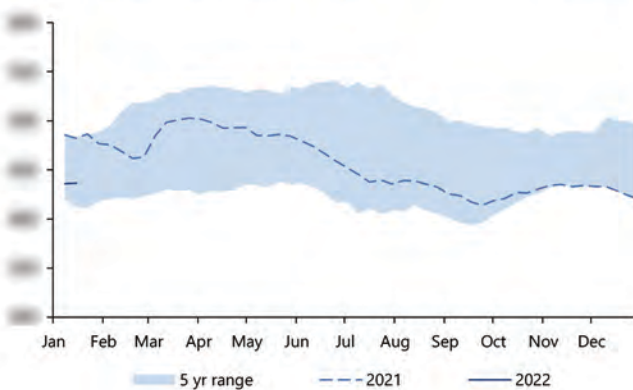
Higher input values for natural gas based hydrogen in Europe have affected hydrocracking and hydrofinishing operations costs, and could force refiners to shift activities, increasing middle distillate supply. We see natural gas prices declining by the end of winter, causing costs to soften. Oil and naphtha supply tightness in Europe and Asia by the middle of the year.

Petrochemicals and refining

Higher crude prices pushed up naphtha prices in all regions from late December into February. Cracked gas follows gas (LPG) with cost rise in January after sharp rise in December, with cost margins for propane increasing substantially in Asia and the US. But European crude costs are pressured offshore, naphtha and propane cost margins below cost margins. In Asia, margins across all feedstocks except offshore remained negative in January, decreasing since December. LPG values climbed in January, continuing to weigh on propane dehydrogenation (PDH) cost margins in China. US, Asian propylene prices continue to rise to levels last seen in October 2021, supporting production. Market production margins are triggering lower crude operating rates in the region. Major southeast Asian crude operators are running at reduced rates of 70-80%. Chinese PDH operating rates averaged 80% in the last week of January as scheduled maintenance in some plants was extended.

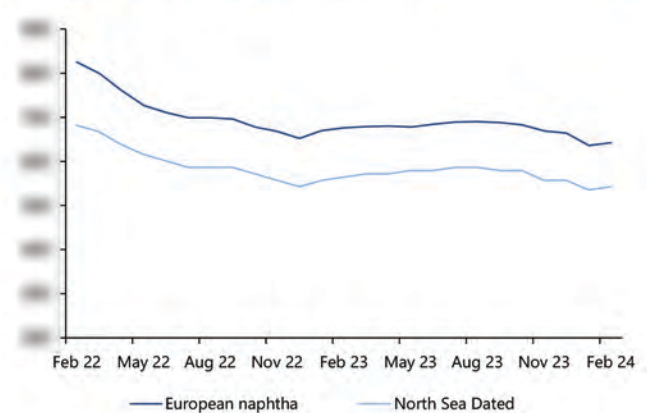
Weekly crude inventories — EIA

mn bl



Europe naphtha vs North Sea Dated

\$/t



Global crude and feedstocks

January global crude spreads increased by \$1.12/bbl to \$22.62/bbl in the US Gulf coast versus light Louisiana Sweet Crude in northwest Europe. FOB spreads increased by \$1.12/bbl to \$22.62/bbl in Singapore, ahead spreads versus Dubai crude increased by \$1.24/bbl to \$24.87/bbl over the same period.

US gasoline inventories are forecast to rise to 265.2bn bbl in the first quarter of 2022, up from 255.9bn bbl at the end of 2021, according to the US Energy Information Administration's 2021 Short-Term Energy Outlook (STEO). US refinery utilization is expected to rise to 84% on average in 2022, up from 83% in 2021. Distillate inventories ended January at 1.2bn bbl, 24% below the five-year average.

In January, nightline crude spreads fell sharply in each of the five key refining regions. The northwest Europe nightline crude fell by \$4.20/bbl against FOB in January, the Singapore nightline crude spread to Dubai crude fell by more than \$4.20/bbl, remaining comfortably above the five-year average. The northwest Europe FOB gasoline crude fell by \$1.40 in January, weighed down by limited export interest. The crude spread is forecast to strengthen in February on firm demand in the European and US markets, and on the start of some refinery turnarounds in the region.

January gross margins for refining increased in the US Gulf coast versus WTI to \$28.82/bbl, fell in northwest Europe versus FOB to \$1.41/bbl, and fell in Singapore versus Dubai blend to \$14.71/bbl. Weak OPEC and gasoline accounted for almost the entirety of the weakness in margins in northwest Europe. The northwest European gasoline crude spread is forecast to strengthen in February on firm demand in the European and US markets, and on the start of refinery turnarounds in the region. This strength means that middle distillates began 2022 about \$10/bbl higher than in January

2021. Looking ahead, margins in these regions should find support in the first half of the year from significant maintenance at Shell's 400,000 bpd Ferris refinery, with one of the two crude units reportedly shut down. Work will complete by the end of June.

Upstream and natural gas

In the week ending 4 February, the total US rig count rose 622, up from 588 in the first week of January. US gas rigs continued to climb to 327 during the same week, up from 316 in the last week of January 2021.

Herry Hall natural gas prices climbed from \$3.20/monthly in late December to \$6.42/monthly in early February, then continued to plummet below \$4/monthly in the week ending 12 February for January delivery month. Herry Hall natural gas prices averaged \$4.26/monthly in January, colder than normal temperatures resulted in storage withdrawals that exceeded the five-year average (2017-20) by 229 Bcf to meet the demand for both space heating and electric power burn. In January, US liquefied natural gas (LNG) exporters continued to operate at maximum capacity, resulting in exports above 12 Bcf/d for the second consecutive month.

US ethane remains relatively cheap in the upper 50s of US\$, with natural gas forecast to maintain a deep discount to other energy sources with associated ethane supply sufficient for expected cracker additions.

In Europe, the UK natural gas sent out to the transmission grid reached \$5.9bn mtd for the week ending 12 February, on track for a February record yet down from January's 25.9bn mtd. Some 24 LNG cargoes were expected by 12 February, but only two cargoes had so far declared arrival in the UK for later in the month.

Americas outlook

Near term

Ethylene prices should continue to moderate very slowly as we move through the turnaround season. If there are more unplanned shutdowns for propylene producers in the first quarter, then we could see sharper price increases in March as propylene stock levels dip and derivative manufacturing strengthens.

Long term

Ethylene prices will slowly weaken and follow Asian prices for most of 2022 and 2023. Argus' forecast for PGP prices continues to show a decline through the end of 2022 and into 2023 based on expectations for feedstock prices, rising cracker and PDH operating rates, and balanced supply and demand in North America.

Ethylene

Over the last few months we have seen the fundamental relationships we used to see that the relationship between price, supply, demand and inventory are no longer valid. With much of the Asian market under a highly locked liquid commodity market, the market is not - with the caveat that it will only be for a short period.

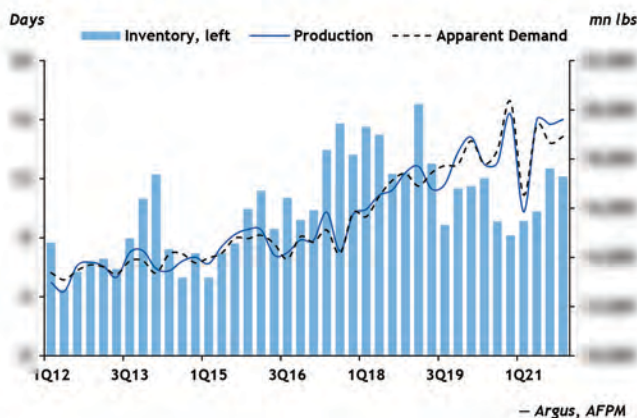
Germany - In the current low propylene (PGP) and ethylene market - normally drive prices down in all regions. **High inventories** - In the US for the US, with the American Chemistry Council (ACC) recently reporting over 100 million lb of inventory build in January - normally push prices down in the region. A lack of volume of production for these they are all full of product along with warehouses that are also full of product normally push to price decreases.

We have seen the general fundamental relationships we use used to see that we have learned from textbooks, and experience tells us that product like propylene (PGP) can be efficiently shipped from location to location and region to region. This is the competitive mechanism that drive price movements based on fundamentals.

As supply in the petrochemical market has caught up to demand in the last few months or so, the lack of steady and cost efficient customer shipping has allowed US prices to remain a much higher than their would normally be the case. The locking has prevented downstream regions such as Asia to dip their propylene to higher priced regions such as the Americas. Instead, regions such as product have had to reduce production.

We will expect the trough for these markets to begin in 2022.

US ethylene production, demand and inventory



over into 2022. Our price dynamics have become quite unpredictable. So, the largest risk to our forecast has been and will be the rate of price declines, primarily in Europe and the US. Determining the impact of ineffective logistics on prices is not really possible and we have very little confidence in how long the supply chain issues will continue and what the shape of the recovery of the system will look like.

The second largest sensitivity in the current market is the price of crude. We point this out because the uncertainty in the fuel cost stage of the crude forecast has increased substantially in recent months. Asian ethylene and PG prices have been supported only by multiple costs. In the short term, Asian prices will be persistent in the US ethylene and prices will be very much driven by crude prices over the next couple of years. The reason for the US spot price sensitivity, which has not been much of a sensitivity historically is because we project the US to be somewhat long on ethylene on average, and the US will need Asian ethylene demand to balance supply better.

Americas outlook

Lately, we should mention fundamentals. As discussed, fundamentals have not been as important a predictor recently. The American Fuel and Petrochemical Manufacturers (AFPM) association reported US ethylene inventories have maintained levels of over 12 days of inventory, about 50% more than is required to run the Gulf coast system efficiently. But all of this inventory is required to cover turnarounds that are going on now and further into the spring.

We expect the market to become larger in the second half of the year, partly because of the Winter weather, and for the length to continue until late in 2022 when significantly more derivative production is expected to come on line.

Propylene

Last February, a historic freeze snap crippled the petrochemical industry across the southern US. But what has changed? Weather future has been gentler this winter, and the lessons learned seem to be playing out in the second half of February, but may be too subtle to pick up. As 2022 came to an end, propylene producers anticipated some significant turnarounds for propylene producers on the US Gulf coast. In anticipation, propylene producers built inventory, lots of it.

On 1 February, when AFPM reported its 2021 year-end inventory and production figures, one metric stood out. The report showed that the combined stocks for chemical grade propylene (CGP) and polymer grade propylene (PGP) had risen by 112bp in the fourth quarter of 2021. The association did not break down the split between PGP and CGP for the fourth quarter. The scale of the rise was significant. Producers surveyed by Vitol Consulting on behalf of AFPM reported that inventory rose by 122,000 in the fourth quarter. That is nearly half of the capacity of a typical propylene dehydrogenation (PDH) unit in the US, and we know what happens to prices when one of these goes off line for a week or longer. The inventory starting point had been a very typical at the end of the third quarter. You could argue that the growth was abrupt and supported two considerations. The first was producers' collective confidence of moving the winter inventory during the first quarter of 2022 due to expected demand. The second was probably the memory of last winter when shortages triggered high prices for much of the year, and no one wanted to allow that.

Now we find that additional unplanned shutdowns and rising export demand have tightened the supply and demand picture in the US, and that has brought prices up. It could be argued that in the absence of the fourth quarter inventory build, market prices for spot volumes would be markedly higher than the \$1.54/lb spot trade deal reported on 26 February.

Shocks to propylene supply have also impacted refinery grade propylene (RGP). On 7 February, we learned that a power outage had shut down two refineries in Texas City, Texas. Weather's role has a capacity of 100,000 bbl while Weather's refinery has a capacity of 225,000 bbl. Spot RGP trades are not as common as for PGP but we have seen a rise in call and pipeline spot trades since these units went off line. No word has been provided on when they

With the above as a backdrop, we can describe the US propylene market as sensitive to unexpected events, such as by weather, hurricanes or significant unplanned shutdowns. That is nothing new but it does bear repeating, so we put the declining prices in late 2021 into context with what we see now and can expect going forward. When steam crackers, refineries and PDH units run as they typically do, US producers generally can outpace demand and support some export volume. We expect this type of balance to reoccur in the coming months, triggering further reductions in PGP prices for the balance of the year and leading out.

Just as we see in January, much of price forecasts over the next few months have again risen sharply. This has had some influence on expectations for propylene, and delays the price erosion we had predicted last month. Further on the horizon, we have not seen a reason to adjust the propylene forecast for much of 2022, although slight changes have been made where fundamental relationships warranted adjustments.

Polyethylene

PE operations in February are somewhat constrained because of a few planned or ongoing turnarounds, some reduced production due to ethylene disruptions, and other shortages or other logistical challenges that have caused some producers to run at lower rates. Export prices have mostly stabilized around the mid-60s \$/lb, with the excep-

Americas outlook

tion of lower low density polyethylene (LDPE), which has seen prices increase in recent weeks. While oil prices are attractive to most regions apart from Asia, buying activity remains reduced because of shipping difficulties, with most ports and warehouses backed up, and shipping rates held in check. January PE production rose to 4.8Bblm bbl, up by 5pc from December's levels, with plants running on average at around 85pc of total capacity, according to preliminary data from the NCI's Plastic Industry Producer Statistics Group as compiled by Tech Consulting. PE sales in January fell sharply to 4.2Bblm bbl, down by 4.6pc from December's levels, with exports down by 15.5pc and domestic sales down by 1.6pc over the period. With production far exceeding sales, producers added a whopping 577m bbl to inventories in January, with an increase of 537m bbl alone for LDPE, followed by a 377m bbl build for high density polyethylene (HDPE) and a 163m bbl build for low density polyethylene (LLDPE). Despite the massive inventory build, some market participants are still describing the market as tight, particularly for LLDPE, in part because of an ongoing shortage of the additive, and in part from a lack of ability to transport the material. After January's contract pricing settled largely flat, producers are aiming to raise prices in February, with most producers seeking between 2-4% worth of increase during the month.

Polypropylene

Polypropylene (PP) supply in February is somewhat constrained, with some production hiccups and a few producers believed to be slowing sales on sales shortages. PP spot supplies remain available, but prices are looking higher, with fresh offers coming in the mid \$1.45-\$1.50 level. January PP production rose to 3.3Bblm bbl, up by 18.2pc from December, with plants operating at around 85pc of total capacity last month, according to the NCI. January sales also increased, rising by 2.5pc to 3.4Bblm bbl, with exports down by 9.6pc and domestic sales up by 1.5pc over the period. With output exceeding sales, producers added around 65.5m bbl to inventories in January, causing dips of inventory to rise again following a

sharp drop in December. Demand continues to strengthen in February, and buyers will need to return to the market in a bigger way to replenish the inventories they have been drawing down. Delivery delays remain a problem. Multiple companies have added surcharges for bulk truck and port-agent deliveries. Additionally, a two-week long truck blockade in Canada, which is now largely over, impacted deliveries from the US to that region. Margins are expected to hold steady in February as sentiment has turned from bearish to bullish on delivery concerns. But when new capacity comes on line in the second half of the year, margins are expected to erode further.

PVC

Pricing for vinyl chloride (PVC) export prices have held fairly steady in recent weeks, following a sharp drop from December to January. Prices have remained around \$1,520-\$1,530 for America for multiple weeks, but sentiment is shifting to more bullish, with prices expected to begin to rise in the coming weeks on improving demand and tighter supply. As the problems continue to hamper production, and there are multiple ongoing hiccups for feedstocks (acetylene, ethylene dichloride (EDC) and vinyl chloride monomer (VCM). Additional PVC hiccups are expected in March. US PVC output fell to 1.2Bblm bbl in January, down by nearly 5pc from December's levels, with plants running on average at around 85.5pc of capacity, according to NCI. January's sales rose to 1.2Bblm bbl, up by 1.2pc, with exports up by 3pc and domestic sales up by 6.5pc over the period. With production still exceeding sales, producers added around 47.5m bbl to inventories in January. Demand continues to improve as the market gets closer to the spring construction season. New US residential construction increased in January, with US building permits at a seasonally adjusted level of 1.8M, up by 0.5pc from December and 0.6pc above January 2021, according to the US Census Bureau. US housing starts fell by 4.5pc from December, but remain 0.6pc above January 2021's levels. Export prices should gradually increase as demand improves.

Europe outlook

Near term

Derivative price spreads will decline more slowly than expected as good demand and high freight prices lead to limited import pressure. Declines in derivative pricing will not be replicated on the monomer side, where prices will decline at a slower rate.

Long term

Global ethylene and propylene balances will lengthen on excess new capacity. Buyers will eventually gain pricing power and seek to drive pricing downwards. European producers will have a stronger cost position than in previous downturns, while extensive maintenance and project work in 2022 will offer supply-side support and generate the need for imports.

Ethylene

Over the last few weeks European domestic ethylene demand will remain above expectations on strong packaging and detergent demand and increased spending on home improvement projects. Domestic supply is adequate to meet any near-term needs, but imports continue to be required to cover unpermitted shutdowns and planned maintenance.

Current ethylene margins have fallen as energy costs rise, leading to price increases confined to February and further price pressure through to the maintenance season in mid-2022. The derivative balance will loosen over time, but with a lack of competitive imports, it is taking longer than previously anticipated to materialise because of a chronic shortage of containers. Maintenance in the spring and autumn of 2022 will support European ethylene prices, while the closure of the Telfer steam cracker in mid-2022 and major project work at a full cracker will create sustained difficulties for 2023's balance. As a result, we expect ethylene differentials over capacity to remain higher for longer as major shifts upstream from producers. Nevertheless, the inevitable drop in derivative prices when they finally materialise will feed through to replicate ethylene price spreads through the second half of 2022.

Propylene

The propylene balance remains firm as improved demand coincides with major unplanned supply-side issues, placing an increased onus on imports to cover shortfalls in domestic supply. Demand for polypropylene (PP) derivatives remains buoyant as demand for packaging and medical supplies is sustained and competitively priced imports remain con-

strained by high freight costs. Likewise, the recovery in automotive and global derivative trade continues to support robust demand, especially as supply chain issues result in high energy costs and falling steam cracker margins coupled with the loss of derivative imports and sustained robustness in derivative demand will slow the anticipated reduction in propylene pricing until the third quarter of 2022. The relative strength in propylene pricing is unlikely to change significantly unless there is a noticeable change in demand, as there is the ability to export European derivatives because of costs. In the near term, we cannot anticipate any of these changes occurring.

Europe is short of propylene and needs to import. We therefore expect propylene to essentially maintain or exceed its relative strength to ethylene well into 2022 before the new propylene dehydrogenation (PDH) unit is commissioned in Belgium. Contractual discounts for propylene are considerably lower than for ethylene. Prices will move up or down monthly, replicating changes, resulting in higher near-term propylene prices. Pricing through to 2022 will depend on the continued export of European derivatives. If derivative exports become uncompetitive on a global basis, then demand for domestic propylene will ease back and may pull pricing downwards.

Polyethylene

Over the last few weeks European polyethylene (PE) margins remain at record high levels. The pressure of unusually robust demand was offset by low stocks ahead of the maintenance season, upstream supply-side issues and the continued limitation of the free flow of advantageously priced imports. Spot imports

Europe outlook

They reach the market in late February or March, but are likely to be restricted to commodity high-density polyethylene (HDPE) only. For now, higher upstream energy costs will drive near-term pricing and margin discussions. Eventually, the market will see an end. Demand supply will improve, container constraints will be resolved, imports from the US will grow, new capacity introductions in China and Korea will begin to swing the Asian balance, and European buyers will need lower prices to compete.

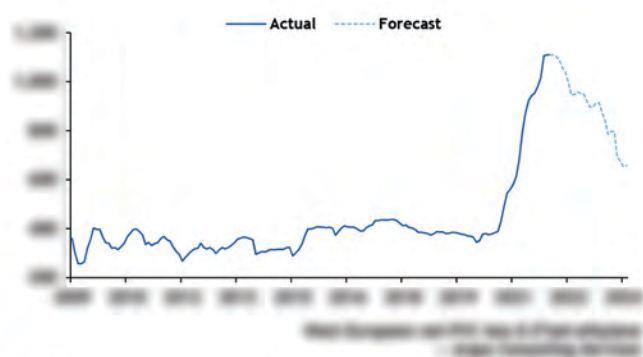
When buyers sense that supply options are improving, they will act quickly, and producers will respond to maintain market share. The issue is when. We thought this would be evident already, but we now expect some movement towards the middle of 2022 because of the European spring maintenance season, with a major change delayed into the fourth quarter. Low-density polyethylene (LDPE) price spreads will change the most. Linear low-density polyethylene (LLDPE) and HDPE margins have not risen to the same extent as LDPE, and so will not decline to the same extent. Commodity HDPE MFR margins have already declined well below LDPE levels, due in part to a shortage in co-monomer resulting in greater HDPE production from using units. For a price correction for HDPE MFR will not be as abrupt.

Polypropylene

The PP markets are as robust as PE. Demand in Europe remains above expectations with pricing and spreads at record levels. Packaging and medical demand remains strong, and the recovery in industrial and automotive applications over recent months are being sustained despite inflationary fears. Export demand has been strong, and high-density oil pricing created additional interest from South America. This is now changing as US supplies improve and export prices fall. Producers are already considering some price reductions and are offering margin to pass up the chain to processors. Due to the impending significant growth in PP capacity in Asia, we eventually expect the PP balance to swing to long-term levels. A tight European propylene market will provide a strong cost floor for PP prices, but we would expect monomer polymer spreads to show significant change by the end of the third quarter of 2022. Initially, PP pricing should get closer to LDPE as the LDPE price declines disproportionately to PP. By mid-2022, we expect PP oversupply to begin to have more of an impact and for relative pricing strength to move back towards LDPE.

Net PVC-ethylene spread

€/t



PVC

As with PE and PP, polymer blends (PVC) margins are being sustained well above the historical average. A combination of increased demand from home improvement and construction activity and a succession of planned and unplanned supply-side production constraints have supported a tight demand balance. The market has also benefited from a lack of attractively priced imports from the US, and a general sense that the medium-term PVC balance is fundamentally stronger than that of PE and PP.

Near-term pricing remains robust, with price spreads above the ethylene cost at record levels, supported in part by the incremental impact of higher utility costs on the ethylene-to-ethanol margin. As these higher utility costs now feed through 2022, it is unclear how quickly these reductions will feed through to lower PVC prices. We judge this will take time as buyers have little leverage in the negotiation as long as demand remains this strong. Eventually, supply will improve and the market will rebalance. As demand eases back, price margins will decline, but will not be at much higher levels than in previous years.

The medium-term balance for PVC should remain positive for producers. Inflation increases and a consequential slowdown in automotive and construction output would clearly be detrimental to PVC demand, but in contrast to the major demand collapse in 2020, PVC supply is in better balance and the general European housing market is not in crisis. Therefore, PVC margins should be far more robust than for PE and PP through this current crisis. Margins should nevertheless slide slightly in response to lower ethylene costs, but should remain well above average levels throughout the forecast period.

Asia-Pacific outlook

Near term

The near-term outlook is propped up by higher feed-stock costs, and will gradually be underpinned by weaker downstream margin. Concerns from market participants continue with new capacities in the region impacting the supply and demand balance.

Long term

Growing demand in Asia, notably China, will continue to support regional prices in the longer term. Additional production capacities, mainly from China's new large refinery-petrochemical integrated projects and PDH units, are expected to bring weakness to olefins. Less competitive producers, i.e. non-integrated, are expected to be hit the hardest.

Ethylene

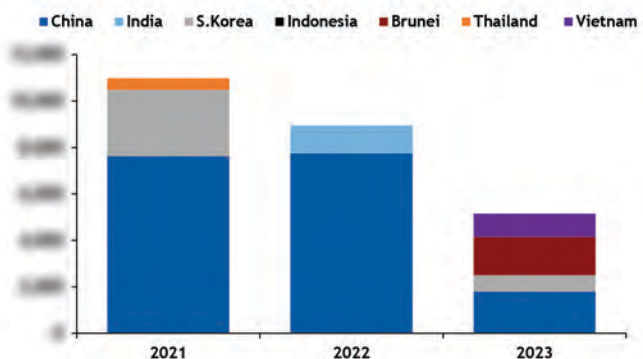
Asia-Pacific markets are looking to all run well on the back of higher ethylene margins and high supply in Asia. This situation surfaced following South Korea HMC's feed switch, which triggered its firm purchase contract. This affected HMC as more of its production is in downstream sales, including Sejin Chemical, Hanjin Solubox and HulsAsia. The shortage may be made up for if capacity in the region increases over the upcoming weeks. But this may be a risky undertaking because supply length could exert downward pressure on the market. Nevertheless, the upcoming shut-downs will continue to support near-term ethylene activity. Scheduled reactor turnarounds are expected at Ingersoll Rand ethylene for three months, Mitsui Petrochem Korea's 80,000 tpy reactor for a month, and Thailand PTT's 80,000 tpy reactor in the first quarter of 2022.

In the medium term, Asian ethylene market is expected to remain as a result of emerging supply pressures. The region

will be exporting more ethylene supplies from new units such as in China and India in 2022, strengthening the supply outlook. The impending shift of downstream supply is also causing downward pressure on downstream margins. Price rise opportunities are ethylene prices headed for a trough in late 2022 as more production capacities come on line, supply in China and Japan drags downstream demand. But the start-up status of India Hindustan Petroleum Ethanol Energy (HPEC) and Thailand's petrochemical complex in the third quarter of 2022, along with continuous freight issues, will support Asian fundamentals this year. This will inevitably support the Asia price of the commodity and delay the trough towards 2023.

Over the longer term, Asia is expected to further expand its market share within the ethylene chain, and shift towards a balanced state within the ethylene and petrochem market with the arrival of more integrated facilities in the region. Short-term demand on a macroeconomic basis from risk averse strong incremental growth to absorb such supply excess. This will force rationalization among less competitive producers and moderate ethylene derivative units.

Asia ethylene yoy capacity growth, 2021-23 '000t

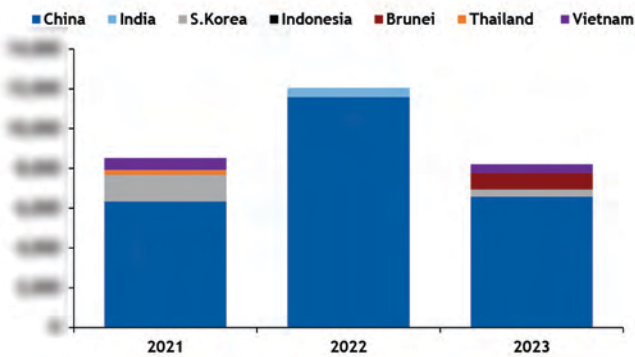


Propylene

Production issues at the start of the year tightened propylene supplies in southeast Asia. Margins are expected to stay flat in the near term following the unplanned reactor shut-downs at Taiwan CPC and South Korea HMC No. 4 unit. There was a feed explosion during HMC's feed exchange testing. The facility will probably be shut for three months for investigations. Similar to ethylene, producers in South Korea are using the opportunity to increase operating rates and the shortage of stable supplies and increasing freight.

Asia-Pacific outlook

Asia propylene yoy capacity growth, 2021-23 '000t



Downstream demand has risen gradually following the ease of Covid restrictions. Demand for polypropylene (PP) in southeast Asia is slower compared with northeast Asia. Stronger manufacturing activity across the summer for electronics and home appliances will drive some demand recovery. Vaccine programs will assist the recovery as the world transitions into endemic living. But the industry remains cautious as market participants observe the Chinese export and import restrictions imposed by the government. The government may be temporary as the export shows to be smaller than expected and with a low hospitalization rate. Overall, market players are also concerned about the emerging supply from new plants. The expectation is that lengthening supply will suppress propylene values towards 2023. China will bring on the approximately 1.8m tpy of additional merchant propylene production. So Chinese propylene supply will remain ample as the market is unable to absorb the additional molecules, subsequently putting a cap on propylene prices. Thereafter, demand growth is anticipated to catch up as the industry sees slower capacity growth from 2023 onward.

In the long term, propylene prices are expected to see support as demand gradually recovers in the automotive and construction sectors. The timeliness of new supplies from major complexes in China and Malaysia, together with incremental economic outflow from the US, will be a key determining factor of the extent of downstream pressure on propylene prices from 2023 onward.

Polyethylene

Regional polyethylene (PE) fundamentals remain balanced, despite weak margins reducing ethylene and PE production.

In the near term, market participants remain cautious about polypropylene derivative products as new production emerges. Zhejiang Petrochemical started up its 300,000 tpy high-density polyethylene (HDPE) unit along with 400,000 tpy of low-density polyethylene (LDPE). Sinopec Zhenhai Refining & Chemical has started up two new HDPE lines with a combined capacity of 400,000 tpy. Indian oilfield HDPE planned to start up its 300,000 tpy linear low-density polyethylene (LLDPE)/HDPE plant and 400,000 tpy HDPE unit, but the start-ups were delayed until later this year. With the rising supply of PE as well as Chinese export uncertainty, buyers are reluctant to accept significant increases in pricing. But downstream demand for finished PE goods is stable as the countries gradually ease restrictions on economic activity and travel activity continues to increase. This is driving downstream consumption. Despite regional Covid cases continuing to rise with no strict restrictions yet imposed, the PE market sentiment is forecast to remain firm as manufacturing demand continues in the spring.

Asia could also see more PE supplies from new US capacities, but this is highly dependent on freight availability, start-up timelines and arbitrage. The industry is watchful of the impending start-up of new supply in Asia, including the potential impact of the long-alled full-thru cracker in Singapore, but technical issues have further pushed timelines to later in 2022. Start-up and ramp-up timelines for the integrated facilities will have a significant impact on stabilizing the current low prices and long-term pricing outlook.

Polypropylene

Polypropylene (PP) sentiment remains steady in the near term, with expectations for continued support from higher feedstock costs, which are expanding producers' margins. High feedstock costs and higher prices will continue to set the floor of the PP pricing. Tighter regional supplies following planned and unplanned maintenance are expected to further aid in PP margins. Vietnam's Hyspec is running at reduced rates because of a feedstock shortage. Indonesian Polymers, Thailand's BPC, Indian Refineries and Qipal are planning to undergo maintenance in the first quarter of 2022. While higher PP prices in southeast Asia are opening the arbitrage for Chinese PP exports, uncertainty in freight and import arrival will deter buying interest in the market.

Covid in the region continues to affect sentiment and down-

Asia-Pacific outlook

ARGUS OLEFINS OUTLOOK is a leading industry publication providing comprehensive market analysis and data for the olefins and polyolefins sectors. The publication covers the entire value chain, from feedstocks to end products, and offers detailed insights into regional and global market trends. It is an essential resource for industry professionals, investors, and analysts seeking to understand the complex dynamics of the olefins market.

ARGUS OLEFINS OUTLOOK provides a comprehensive overview of the olefins market, including detailed analysis of regional and global trends. The publication covers the entire value chain, from feedstocks to end products, and offers detailed insights into market dynamics and future outlook.

PVC

The PVC market is expected to continue its growth trajectory in 2022, driven by strong demand from the construction and infrastructure sectors. Key factors influencing the market include rising energy costs, which may impact feedstock prices, and ongoing supply chain challenges. The publication provides a detailed analysis of these factors and their potential impact on the PVC market.



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