

Changing BD trade flows and cracker consolidations

Angie Joe
Brian Leonal



| Argus Media group notices

- The Argus Media group (referred to herein as “Argus”) makes no representations or warranties or other assurance, express or implied, about the accuracy or suitability of any information in this presentation and related materials (such as handouts, other presentation documents and recordings and any other materials or information distributed at or in connection with this presentation).
- The information or opinions contained in this presentation are provided on an “as is” basis without any warranty, condition or other representation as to its accuracy, completeness, or suitability for any particular purpose and shall not confer rights or remedies upon the recipients of this presentation or any other person. Data and information contained in the presentation come from a variety of sources, some of which are third parties outside Argus’ control and some of which may not have been verified.
- All analysis and opinions, data, projections and forecasts provided may be based on assumptions that are not correct or which change, being dependent upon fundamentals and other factors and events subject to change and uncertainty; future results or values could be materially different from any forecast or estimates described in the presentation.
- To the maximum extent permitted by law, Argus expressly disclaims any and all liability for any direct, indirect or consequential loss or damage, claims, costs and expenses, whether arising in negligence or otherwise, in connection with access to, use or application of these materials or suffered by any person as a result of relying on any information included in, or omission from, this presentation and related materials or otherwise in connection therewith.
- The information contained in this presentation and related materials is provided for general information purposes only and should not be construed as legal, tax, accounting or investment advice or the rendering of legal, consulting, or other professional services of any kind. Users of these materials should not in any manner rely upon or construe the information or resource materials in these materials as legal, or other professional advice and should not act or fail to act based upon the information in these materials.
- Copyright notice: Copyright © 2024 Argus Media group. All rights reserved. All intellectual property rights in this presentation and the information herein are the exclusive property of Argus and and/or its licensors and may only be used under licence from Argus. Without limiting the foregoing, you will not copy or reproduce any part of its contents (including, but not limited to, single prices or any other individual items of data) in any form or for any purpose whatsoever without the prior written consent of Argus.
- Trademark notice: ARGUS, the ARGUS logo, Argus publication titles, the tagline “illuminating the markets®”, and Argus index names are trademarks of Argus Media Limited. For additional information, including details of our other trademarks, visit argusmedia.com/trademarks.

A view of Argus

Headquartered in the UK, Argus has over 1,300 staff working in 29 offices in the world's principal commodity trading and production centres.

Argus publishes more than 42,000 daily and weekly spot and forward price assessments, along with commentary, news and analysis for global commodities and energy markets.

Coverage includes markets for:

- Oil, natural gas, power, hydrogen, coal, biomass, asphalt, base oils, emissions and carbon
- Biofuels
- Fertilizers
- Agriculture
- Chemicals, including petrochemicals and oleochemicals
- Metals, ferrous, non-ferrous, battery materials, and scrap

Services:

- Market reporting, news, and analysis
- Consulting and forecasting
- Conferences

Argus prices are used as benchmarks worldwide, including for:

- US crude oil
- European gasoline and biofuels
- Asia-Pacific LPG
- Coal
- European steel
- US and European environmental markets



Tariffs.



- Varying rates and applicable countries have changed multiple times in a short period. It is difficult to determine which tariffs will actually stick.
- On 12 May, US tariffs on imports from China were rolled back to 30% from 145%. Beijing will maintain retaliatory tariffs of 10-15% on most US energy and agricultural commodities.
- The key point is these levels are only temporary – for 90 days.
- A decade ago, the US anti-dumping duties on tire imports from Asia-Pacific.
- Tire import volumes have only increased since the start of the duties. The difference is the flow has shifted from China to Thailand, Vietnam, Indonesia and other Asian countries.

Tariff case studies – pre-deal

General Motors

- Revised its 2025 guidance lower to reflect \$4-5bn of auto tariffs exposures.
- The source includes about \$2bn of imported vehicles from South Korea, tariffs on autos imported from Mexico and Canada, and “indirect material imports”.
- Ford said its tariff exposure is \$1.5mn.
- GM has a greater exposure to imported steel

Whirlpool

- “Whirlpool, with its 10 large US factories, is a net winner of a new tariff policy. With our strong domestic footprint, we produce 80% of our domestic sales in the US.”
- Steel makes up about half the weight of a washing machine.
- Pre-tariffs: US manufactured washing machines use domestic steel, which is about two to three times more expensive than Chinese. At the same time, Whirlpool needs to import components like LED panels or certain motors that they must pay tariffs on but are not applicable to Asian appliances
- This has translated to a ~\$70 a unit disadvantage for US-produced appliances compared to identical products manufactured in Asia and imported into the US. “Typically, a \$70 product cost disadvantage, after adding some additional overhead cost and trade margins, will lead to a \$150 retail price difference.”

Tariff case studies – pre-deal

Adidas

- In a 'normal world' ... Adidas would have increased its outlook for the full year both for revenues and operating profit. However, the uncertainty regarding US tariffs has halted this.
- The company already reduced Chinese imports to a minimum, but it is still "somewhat exposed to those currently very high tariffs. What is even worse for us is the general increase in US tariffs from all other countries of origin. Since we currently cannot produce almost any of our products in the US, these higher tariffs will eventually cause higher costs for all our products for the US market."
- Excerpts were taken from the first quarter 2025 investor news release on 29 April.
- The US imported 95.9% of its total footwear consumption in 2021, according to the USITC.

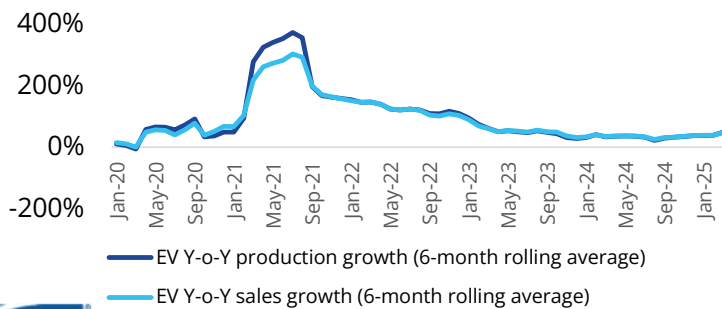
US toy industry

- April 2025: The US Toy Association in a survey of more than 400 member companies, almost half of small and medium-sized enterprises said: "they may soon go out of business due to the current U.S. tariff policy."
- "...While we remain hopeful for a more predictable and favorable U.S. trade policy environment, we must acknowledge the costs imposed by current tariffs.....tariffs translate into higher consumer prices, potential job losses as we adjust to absorb increased costs, and reduced profits for our shareholders." – Hasbro, 24 April 2025
- Mattel CEO Ynon Kreiz on 6 May 2025: A "significant amount" of toy design and development occurs in the US. However, manufacturing products in other countries allows the company to sell at "affordable price points". Pricing action in the US may be taken.
- The company has been trying to diversify manufacturing away from China for the last seven years. At the end of 2025, less than 40% of products will be sourced from China. In two years, no single country is expected to represent more than 25% of sourcing.

The world of tariffs – Auto pain

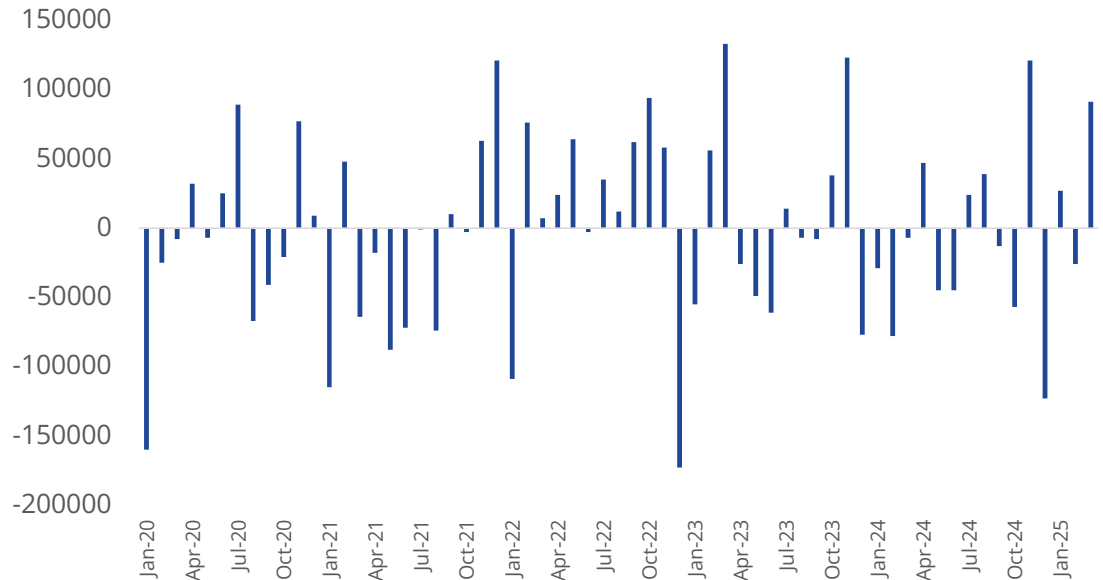
- 2024 was a good year for China's auto market – 166,000 of car inventories were taken out of the market.
- Car productions rose by 3.77%, sales by 4.60% in 2024.
- In March 2025, China added about 91,000 of car inventories.

China EV production and sales growth



Source: China Association of Automobile Manufacturers

China's car inventory movement

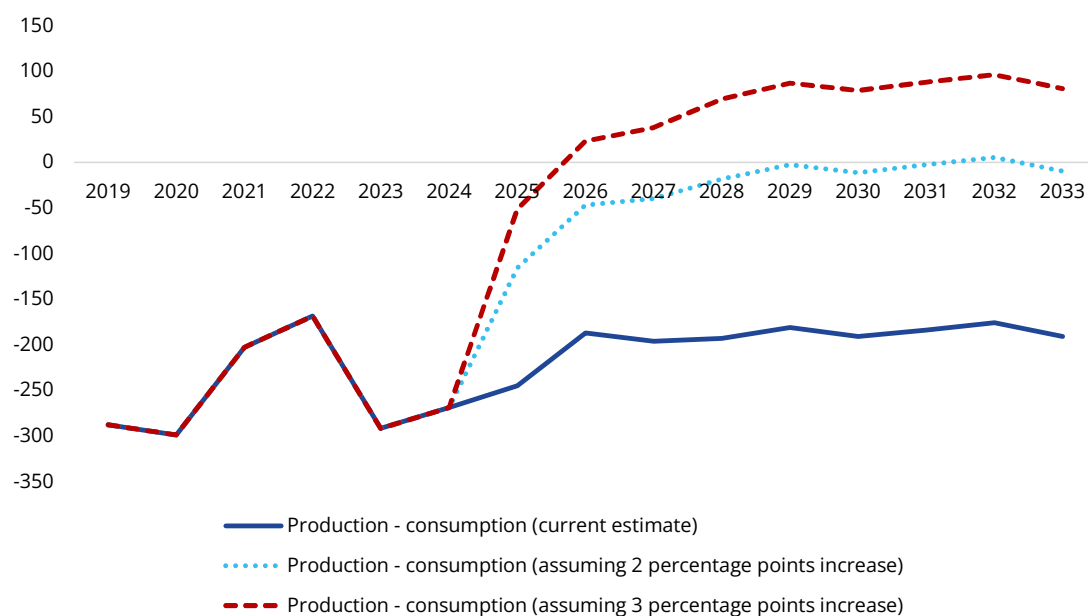


Source: China Association of Automobile Manufacturers

The world of tariffs – Upstream pain

- Prolonged trade tension leads to the lack of ethane and LPG that go into ethane crackers and PDHs.
- Also leads to a lack of US origin polyethylene into China.
- Existing naphtha crackers in China are estimated to have to raise production by 8 percentage points to make up for the shortfall.
- Average 160,000 t/yr of increase in BD production in China assuming 2 percentage points increase in cracking rates.
- Another percentage point of increase will make China a BD net exporter.

Pro-forma cracking rates sensitivities



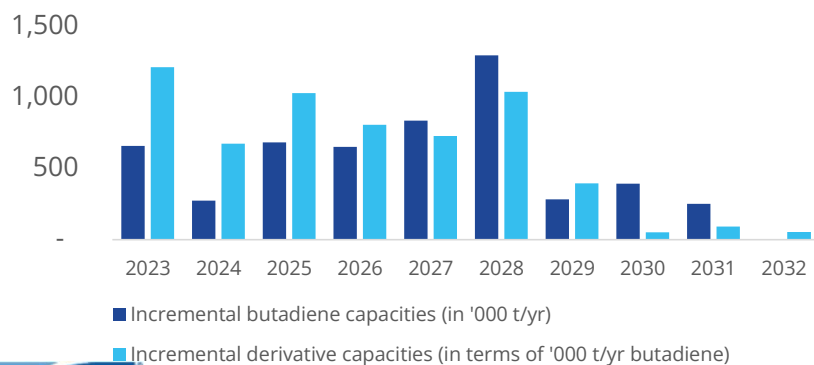
Source: Argus Media

Asia Butadiene view

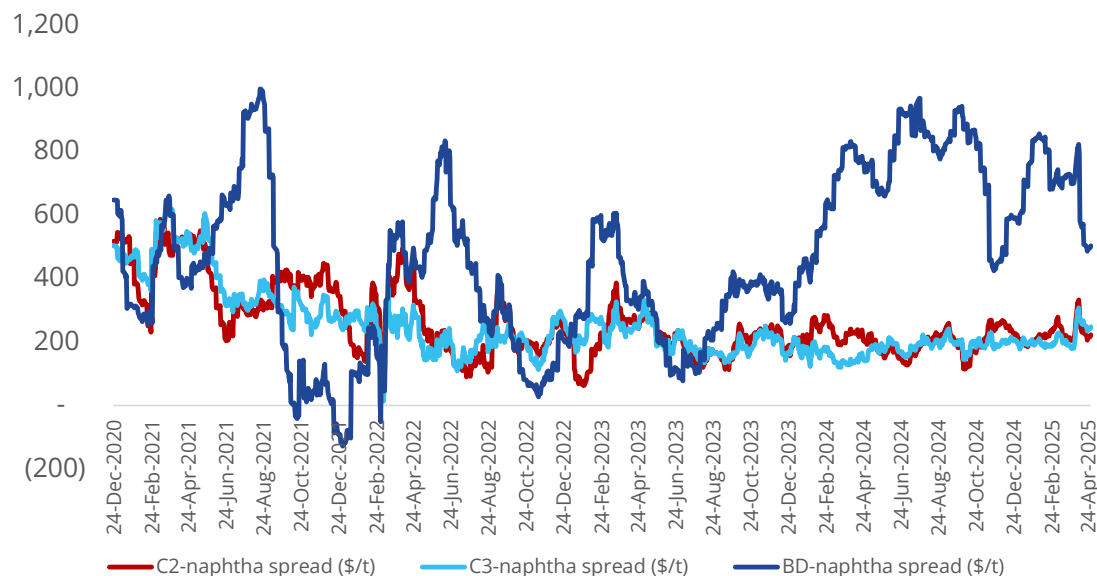
Butadiene Strength

- Continued weakness in ethylene and propylene.
- Persistently low operating rates arising from weak cracking margins.
- Persistent tightness through 2025-2026, when incremental downstream capacities exceed that of upstream.

Incremental supply vs demand capacities



Olefins Spread

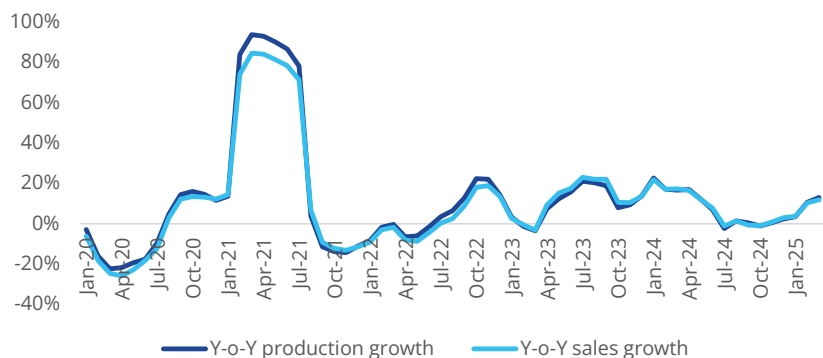


Source: Argus Media

Butadiene Strength

- Auto recovery underway.
- Steady margins for SBR and PBR.

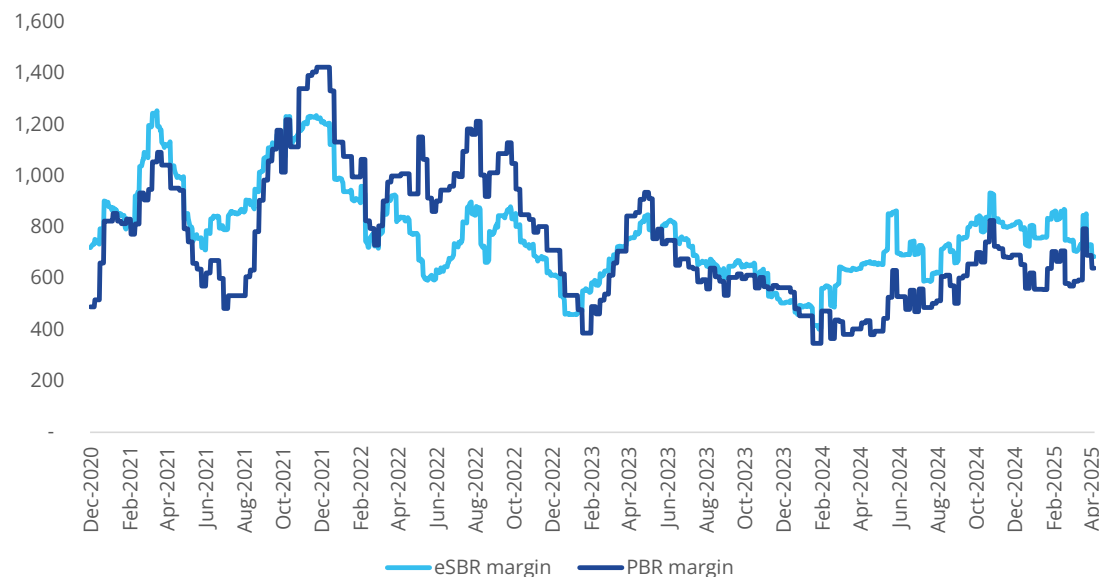
China car sales production and sales growth



Source: China Association of Automobile Manufacturers

(in US\$/t)

SBR and PBR margins

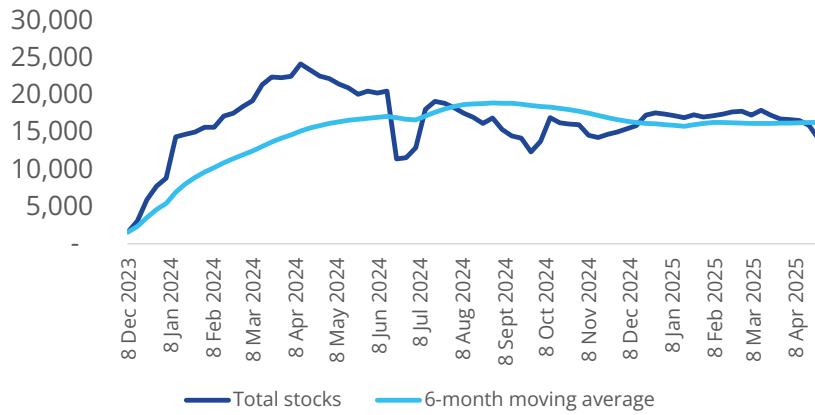


Source: Argus

Butadiene Strength

- Tighter supplies in the past that arose from supply disruptions.
- Destocking underway

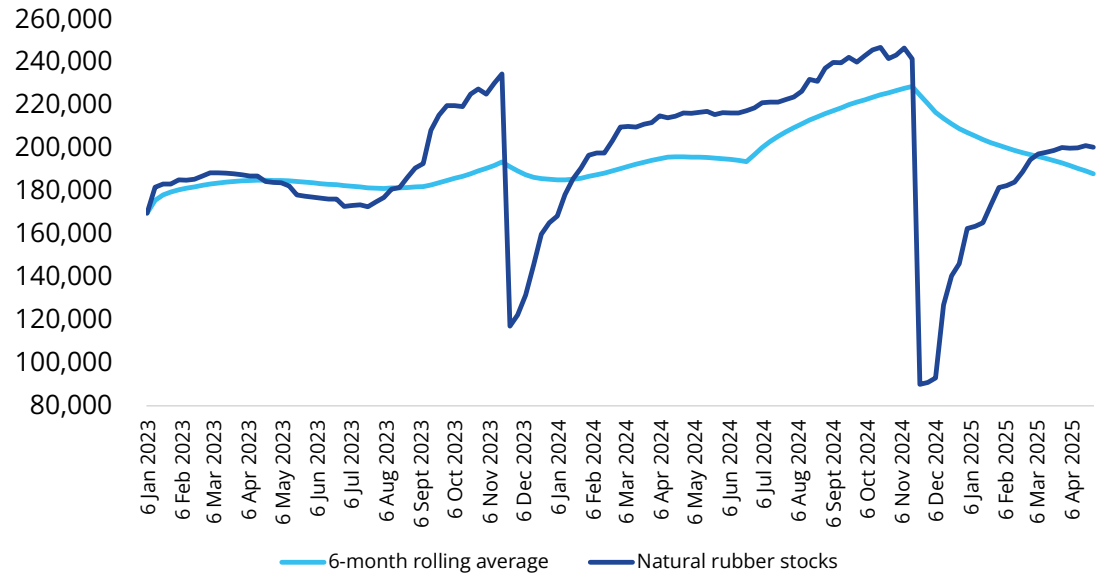
SHFE BR stocks



Source: China Association of Automobile Manufacturers

SHFE natural rubber stocks

(in US\$/t)

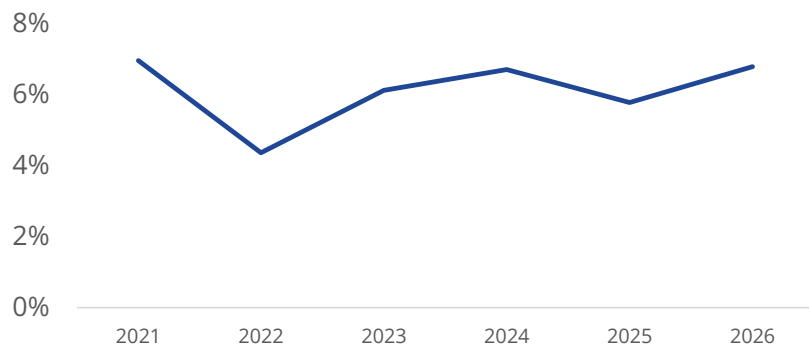


Source: Argus

Butadiene – Supply demand outlook

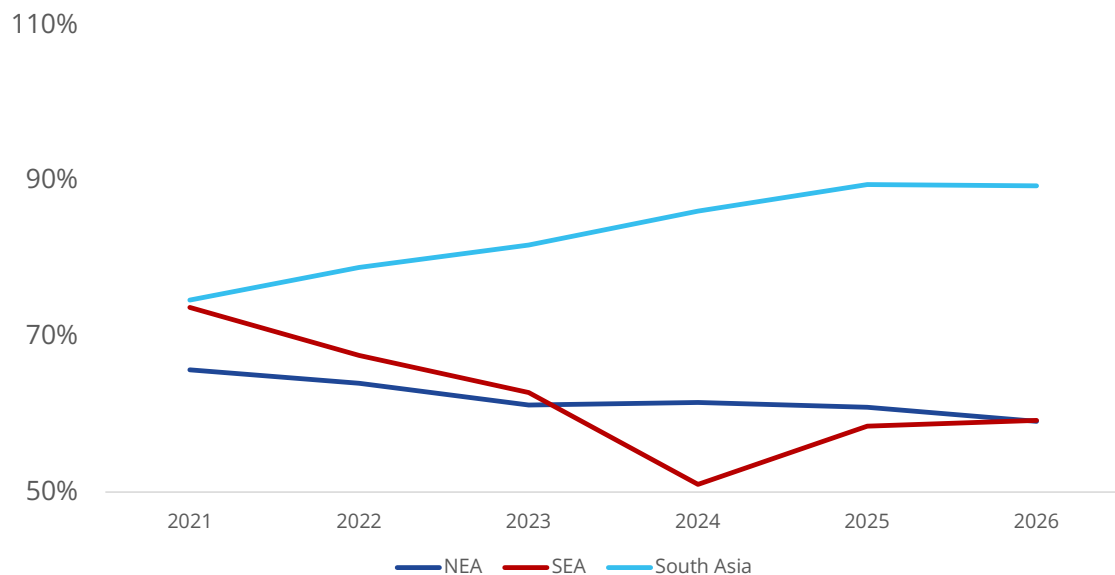
- Higher operating rates of BD units as incremental derivative capacities remain higher than upstream.
- In response, co-cracking rates are expected to decrease.

Co-cracking rates



Source: Argus

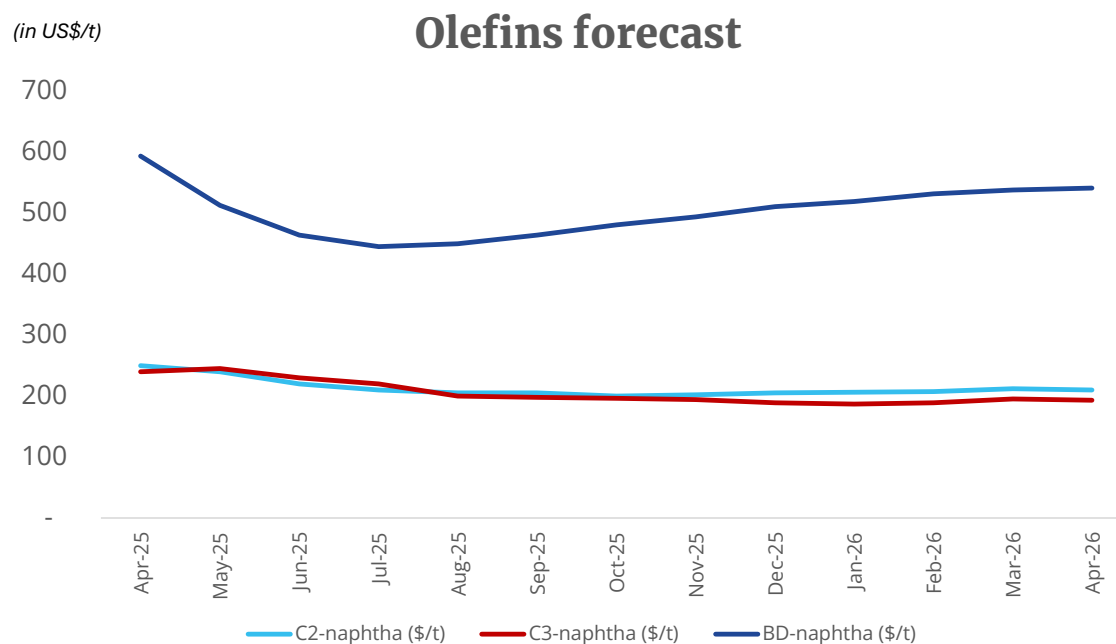
Asia BD operating rates



Source: Argus Media

Butadiene – Price outlook

- Widening BD-naphtha spread, with narrowing of C2, C3-naphtha.
- C2, C3 most impacted by trade tensions, given numerous end-product exports to the US.



Source: Argus Media

Consolidations – still on the horizon?

- Likely – with refinery consolidations continuing. Market is assuming around 10% drop in refining capacities between now and 2050 in China.
- Ageing refineries and crackers in Japan.
- Cracking overcapacity could force smaller, less competitive ones out of business.

Source: China Association of Automobile Manufacturers

Source: CAAM

Consolidations – Common factors

- Low capacity: Most are under 500,000 t/yr of ethylene capacity.
- Old built year: Most were built before the 1990s.
- Some were built after the 1990s, with three notable projects built after 2009. This raises questions on how new petrochemical projects should be valued.
- Refinery integration does not play in the decisions to close.
- Decent impact to BD – numerically, the number of closures since 2020 would equate to about 600,000 t/yr of BD capacity reduction.
- This amounts to about 3 modern-sized BD extraction units.

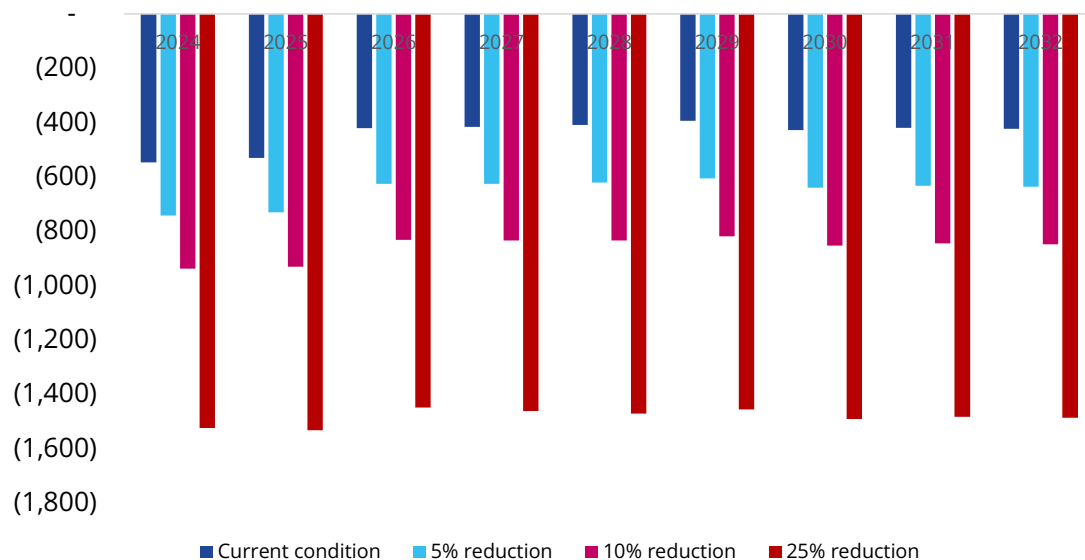
Asia cracker consolidations					
Year	Location, country	Cracker name	C2 cap ('000 t/yr)	Refinery integration	Year built
2020	Ulsan, South Korea	SK Geo Centric	190	Y	1972
2022	Tianjin, China	Sinopec Tianjin United Chemical	200	Y	1999
2022	Henan, China	Sinopec Zhongyuan PC	200	N	1996
2022	Liaoning, China	Fushun PC	180	Y	2012
2022	Jilin, China	Jilin PC	150	Y	1982
2023	Xinjiang, China	Dushanzi PC	220	Y	2009
2023	Liaoning, China	Liaoning Huajin Tongda	160	Y	1976
2023	Liaoning, China	Luoyang PC	200	Y	1984
2023	Shaanxi, China	Shaanxi Yanchang Petroleum	170	N	1988
2023	Shandong, China	Sinopec Qilu	570	Y	1966
2023	Shanghai, China	Sinopec Shanghai	300	Y	1992
2024	Batangas, Philippines	JG Summit	480	N	2014
2024	Pasir Gudang, Malaysia	Lotte Titan no 1	290	N	1994

Source: Argus Media

Butadiene – How consolidation looks

- Stand-alone crackers in northeast Asia were sensitised. (in '000t)
- Southeast and South Asian crackers were excluded, given a good proportion of them were sole crackers in their own countries.
- Sensitivities are done by reducing ex-standalone cracker BD by 5%, 10%, and 25%.
- Asia 2025-2032 shortage averages 430,000 t/yr at current condition.
- Results show between 2025-2032 Asia would generally face BD shortages of:
 - 639,000 t/yr based on 5% reduction
 - 849,000 t/yr based on 10% reduction
 - 1.48mn t/yr based on 25% reduction

Standalone cracker closures impact

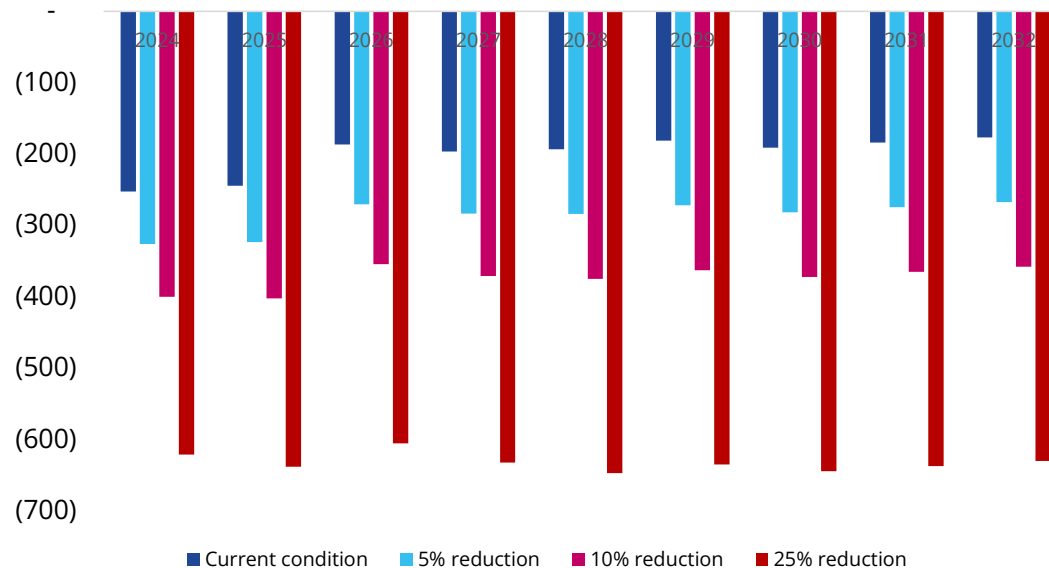


Source: Argus Media

How standalone cracker closure looks in China

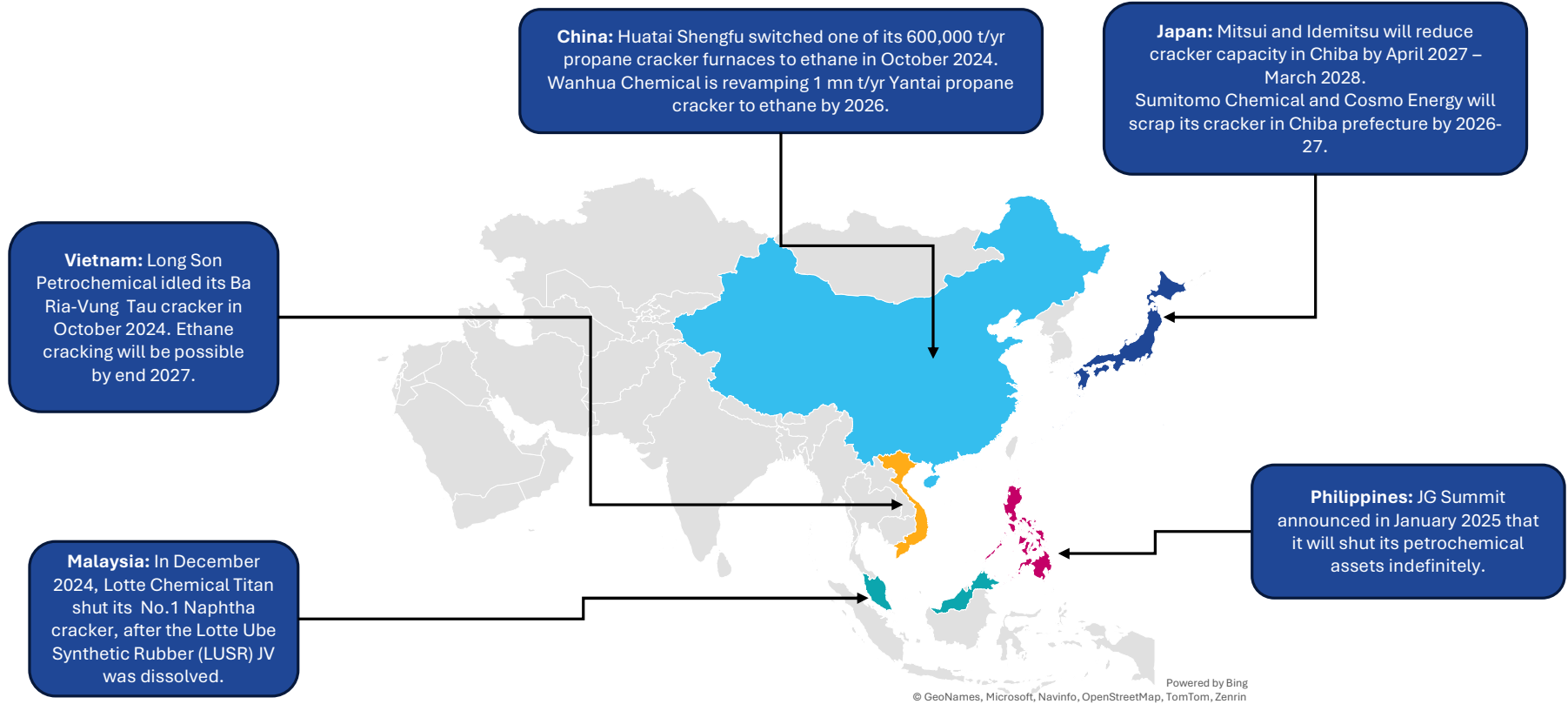
- Stand-alone crackers were sensitised, both Sinopec and non-Sinopec crackers. (in '000t)
- China's 2025-2032 shortage averages 194,000 t/yr at current condition.
- Results show between 2024-2032 China would generally face BD shortages of:
 - 282,000 t/yr based on 5% reduction.
 - 370,000 t/yr based on 10% reduction.
 - 634,000 t/yr based on 25% reduction.

China standalone cracker closures impact



Source: Argus Media

Spotlight: Changes ahead for the Asian cracker fleet

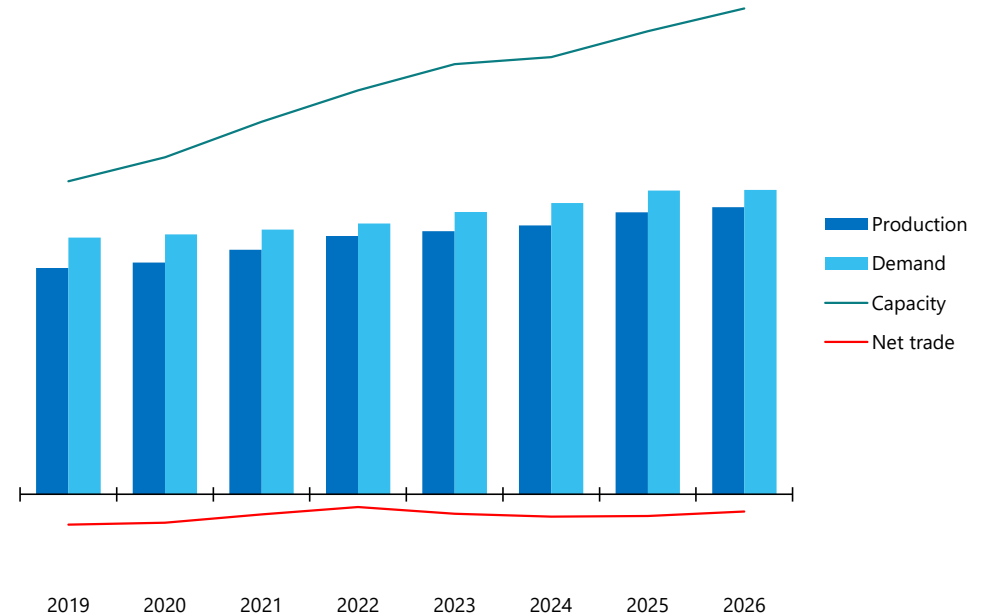


-Argus Media

Northeast Asia butadiene summary

- China makes up the lion's share of regional BD production. In 2023, the country boasted nearly 60% of capacity. This stronghold will be supported by immense cracker expansions.
- Likewise, Chinese demand made up about 60% of regional derivative capacity in 2023. Expansions will continue to push up its capacity to consume.
- Derivative expansions in China outweigh incremental butadiene supplies. Derivative BD capacities are expected to rise at faster pace compared to BD production capacities.
- Solution SBR and PBR growth is highly dependent on demand for electric vehicles.
- Exports from Europe are expected to decline on cracker closures.

Northeast Asia butadiene supply and demand



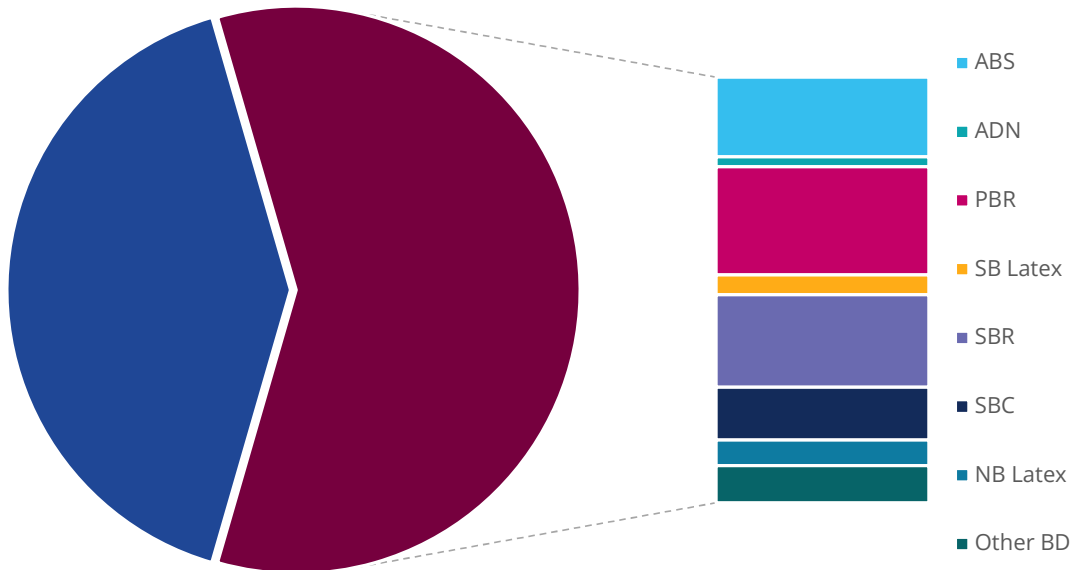
-Argus Media

Northeast Asia demand

New derivative capacity could force older assets to reduce rates or shut.

Northeast Asia butadiene demand, 2023

'000t



- Older derivative assets will struggle to remain competitive against newer, bigger and more efficient assets. Synthetic rubber, ABS and SBC will be the most heavily impacted sectors.
- Post-Covid, nitrile rubber latex demand has been declining.
- Still, demand will outpace supply across the forecast period.

-Argus Media

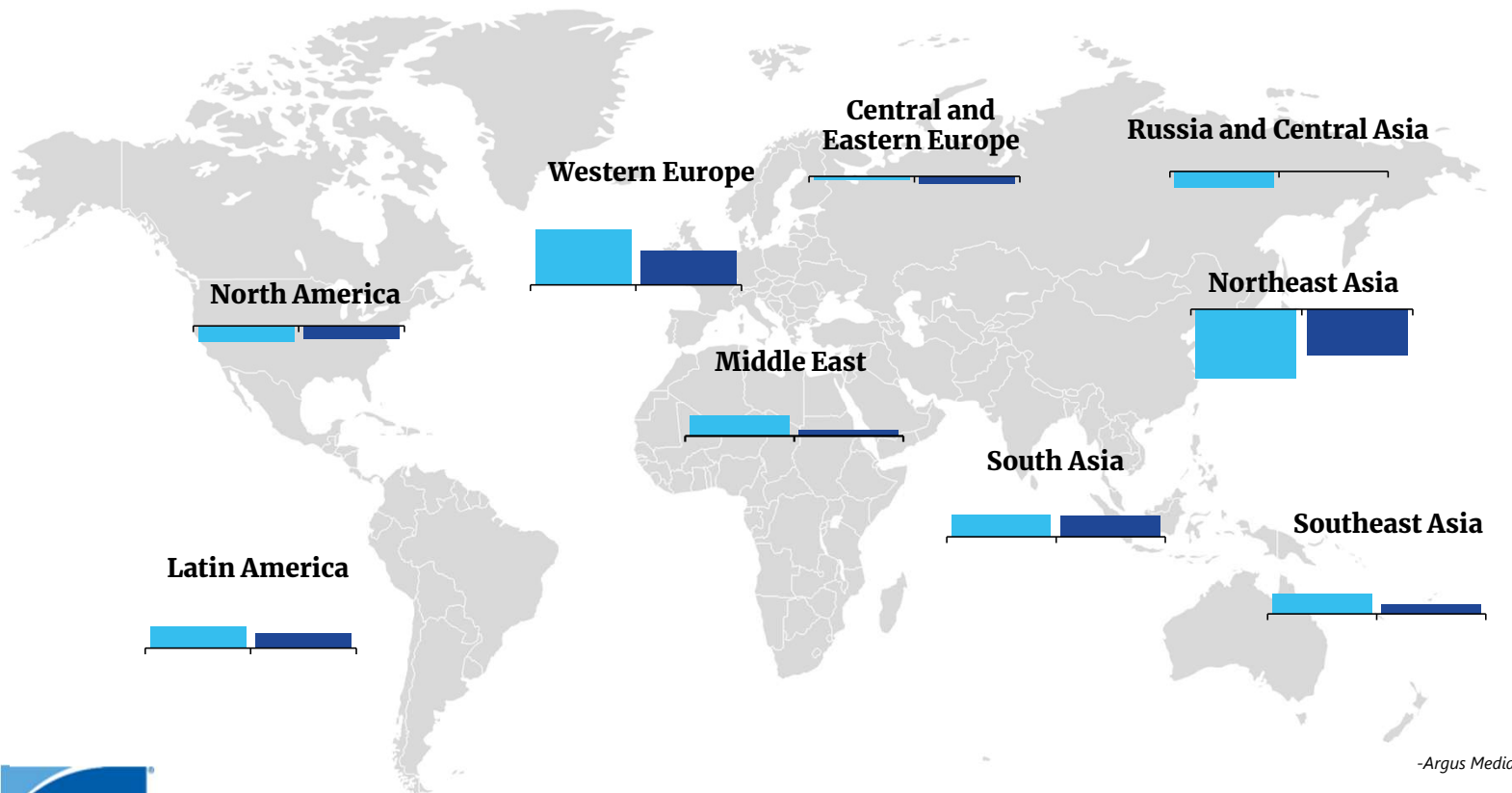


Global forward view for butadiene

Butadiene trade

Butadiene Net Exports, '000t

■ 2019 ■ 2023



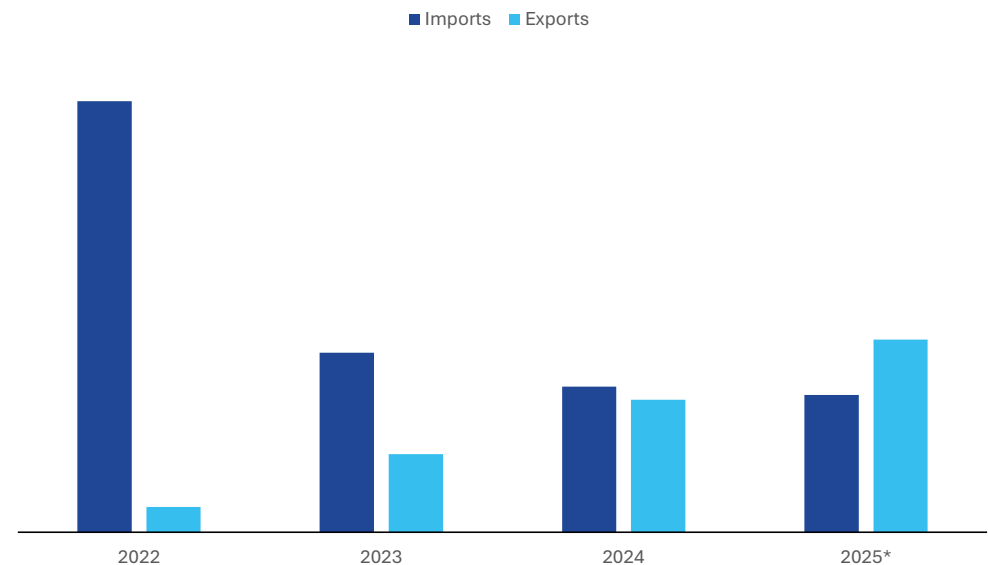
- In 2019, global export flow peaked but will trend lower in the long term.
- The biggest decrease is western Europe given cracker rationalizations and BD supply reductions.
- US imports are slated to decline.
- The primary destination for exports is Asia-Pacific, as it is the global demand center.

US trade flow 2022-2025

Q1 2025 data implies that US exports would outpace 2024 levels. Then came the tariffs.

- In 2022, there was a flux of imports on a covid recovery, cracker maintenance and US crude C4 exports.
- By the end 2023, Invista shut its adiponitrile production in Orange, Texas. In addition, European term imports to the US halted by the fourth quarter.
- In 2024, several unplanned and planned cracker maintenance in the US encouraged imports.
- To start the year and with no tariffs, the US found itself long and was on pace to expand and extend its export streak.

US Butadiene trade (in 000't)



-Argus Media

*Annualized data for 2025

Western Europe crude C4

Supply losses since 2022

- In 2024 ExxonMobil shut its chemical operation at Notre Dame de Gravenchon in northern France.
- Saudi state-owned petrochemicals company Sabic permanently closed Geleen 3, one of the two steam crackers, in the Netherlands.
- Dow will idle cracker 3 when its legal inspection dates are reached, within the next few months.
- In Italy, Versalis will close its Brindisi and Priolo crackers by the end of 2025. The Porto Marghera cracker was closed in 2022.
- TotalEnergies will shut one of two crackers in Antwerp, Belgium, by end of 2027. The unit can produce up to 570,000 t/yr of ethylene.

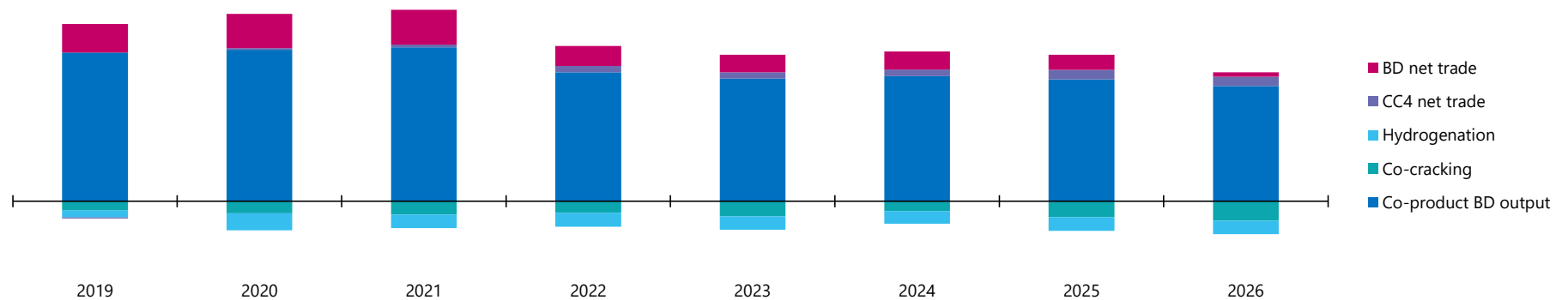
Company	Location	Feedstock	Ethylene Capacity (in 000't)	Start-up / Closure
Versalis	Porto Marghera, Italy	Naphtha	500	Shutdown in 2022
SABIC	Geleen, the Netherlands	Naphtha / Gasoil	550	Shutdown in Q3 2024
ExxonMobil	Notre-Dame-de-Gravenchon, France	Butane / Naphtha / Gasoil	400	Shutdown in Q4 2024
Versalis	Brindisi, Italy	Naphtha	410	Shutdown in Q1 2025
Dow	Terneuzen, the Netherlands	LPG	600	Shutdown in mid 2025
Versalis	Priolo, Italy	Naphtha / Gasoil	430	Shutdown in Q4 2025
Total Energies	Antwerp, Belgium	Naphtha / Butane	570	Shutdown in 2027

Western Europe crude C4 supply

New and upcoming projects will not compensate for the closures.

- Libya's Ras Lanuf naphtha cracker commenced operations in late 2023 and was mostly reliable in 2024. There are ongoing concerns about the political uncertainty and the ability to sustain commercial activities.
- A cracker in Portugal has been closed for nearly two years and is expected to resume operating by 2026.
- Ineos' Project One in Belgium is still forecast to start up in the 2027-28 period, which could put additional margin strains on the region's heavier crackers. Also consider the new ethane-based asset will yield less crude C4 compared to the crackers that have permanently shut.

Western Europe Butadiene Supply

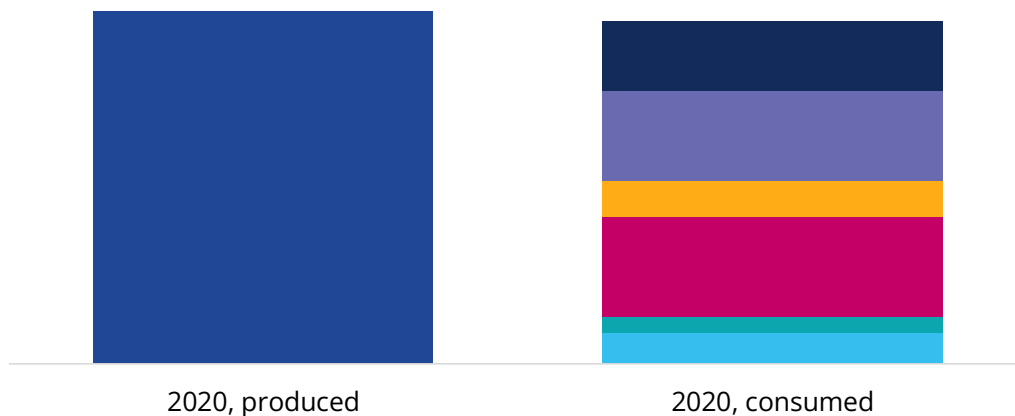


-Argus Media

Versalis will be net short of BD by 2026

The company's €2bn (\$2.16bn) five-year plan includes closures and restructure.

Italy: BD produced and consumed



Versalis is the sole BD producer in Italy

-Argus Media

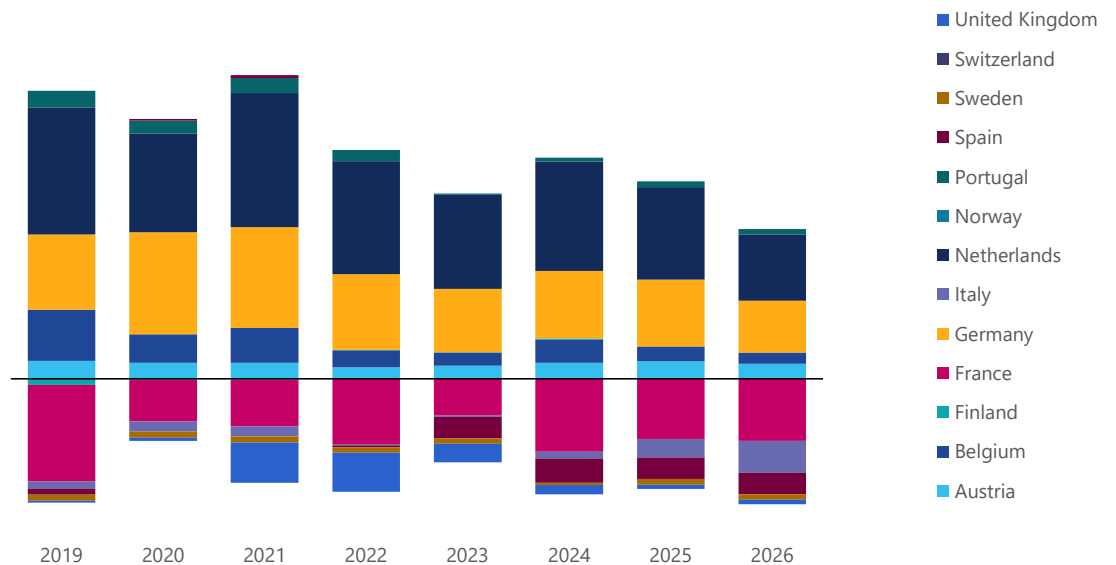


- Versalis was net balanced in 2020. By 2026, the company will need to source crude C4 and/or BD to cover its needs in Italy, which will lower deep sea export volumes from the region.
- Cracker capacity at Brindisi and Priolo will be permanently closed by the end of 2025, because of the "structural and irreversible decline in Europe". Their Porto Marghera cracker was shut in 2022.
- Most of Versalis' BD consumption is concentrated at Ravenna since the closure of Grangemouth, UK, earlier this year.
- In early 2023, the company said it would invest about €80mn (\$88.4mn) at its Ravenna, Italy, site to boost elastomer production. The consumption estimate for now is unchanged in Italy, but the elastomers producer may reduce or idle derivative production. We will continue to follow the progress.

Western Europe trade

Western Europe butadiene net exports

- Exports peaked in 2021 and have been sliding since.
- Producers with barge exposure in 2024 were forced to export even when domestic demand was strong. At least two consumers in 2024 switched from maritime to rail car deliveries.
- Versalis' cracker fleet will be significantly reduced by 2026, but their derivative assets will presumably remain in operation. The change is expected to divert some of the tons that had been exported for domestic consumption.



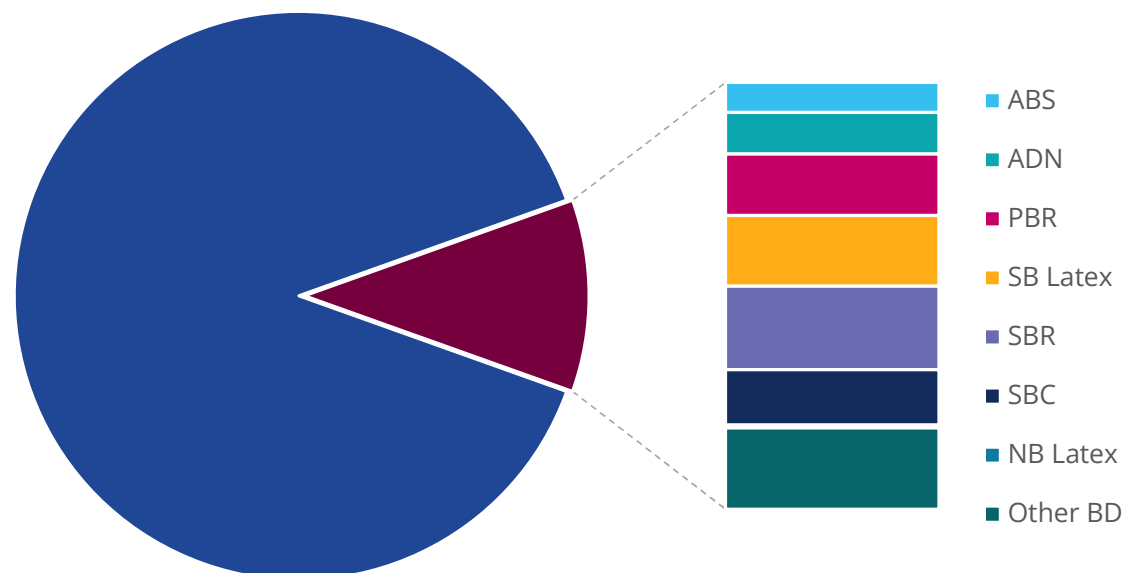
-Argus Media

Western Europe demand

Derivative rates hang on auto demand and export arbitrage opportunities.

- A key factor is whether Butachimie's adiponitrile production in France will run at higher rates or the technical minimum. From 2022-2023, the consumer ran at low rates, although operations were normal for much of 2024.
- Five tire plants will shut between 2025-2027. Goodyear's rationalizations include Fuda, Germany by 2025 and Furstenwalde, Germany by 2027. For Michelin, the plan is to shut Homburg and Karlsruhe in Germany by the end of 2025 as well as Cholet, France by early 2026.
- As such, Europe will need to stay competitive enough to export synthetic rubber or drive out cheap imports of acrylonitrile butadiene styrene and styrene block copolymer.

Western Europe butadiene demand, 2023



'000t

-Argus Media

Key takeaways

The only thing that is certain is uncertainty.

- The US frequently and abruptly has shifted the focus of its tariffs, so forecasting has been even more challenging.
- Expansion in Asia-Pacific will continue, including derivatives. Mature, heavier crackers outside of China may have tough decisions ahead.
- Europe will struggle to find its balance as crackers shut but derivatives for the most part have been unscathed.
- The US was set to boost exports in 2025, although tariffs have upended this trend so far.
- A reshuffling of the supply chain and anticipated higher consumer prices for fewer options will have its consequences.
- Stay tuned!

Asia Butadiene methodology

Argus Butadiene methodology

	fob NEA	cfr NEA	fob SEA	cfr SEA
Locations	Korea, China, Taiwan or Japan	Korea, China, Taiwan or Japan	Indonesia, Thailand, Malaysia, Philippines or Singapore	Indonesia, Thailand, Malaysia or Singapore
Timing	2-6 weeks from assessment date	2-8 weeks from assessment date	2-6 weeks from assessment date	2-6 weeks from assessment date
Minimum trade size	2000t	2000t	2000t	2000t
Price assessment basis	Survey of bids, offers, and deals in the market.	Survey of bids, offers, and deals in the market.	Survey of bids, offers, and deals in the market. In the absence of fixed price discussions, ocean freight differential to cfr NEA is applied.	Survey of bids, offers, and deals in the market. In the absence of fixed price discussions, ocean freight differential to cfr NEA is applied.
Frequency	Weekly (Friday)	Weekly (Friday)	Weekly (Friday)	Weekly (Friday)

Argus Butadiene methodology

Key features:

- Two weeks forward for starting laycan means we exclude distressed cargoes.
- Eight weeks forward for ending laycan means we include some deep-sea cargoes.
- 2,000t of minimum trade size is aligned with market norms and exclude distressed cargoes.

	Argus fob NEA	Argus cfr NEA	Friend 1 fob Korea	Friend 2 cfr NEA
Locations	South Korea, China, Taiwan, or Japan	South Korea, China, Taiwan, or Japan	South Korea only	South Korea, China, Taiwan
Timing	2-6 weeks from assessment date	2-8 weeks from assessment date	3-6 weeks from assessment date	0-6 weeks from assessment date
Cargo size	2,000t minimum	2,000t minimum	1,500-5,000t	1,000-7,000t
Frequency	Weekly (Friday)	Weekly (Friday)	Daily + Weekly (Friday)	Weekly (Friday)

Contact us



Angie Joe
Vice President Global Butadiene and Derivatives

Angie leads the crude C4, butadiene and derivatives consulting practice at Argus. She spearheads the creation and production of the butadiene newsletter, monthly outlook and long-term supply and demand analytics publications. Angie has more than 15 years' experience in the petrochemical industry, including roles as an analyst and broker, and in business development and communications. She also has expertise in styrenics, aromatics, olefins and methanol. Angie enjoys tapping her experience along the entire petrochemical value chain to piece together market information in a global context.



Akash Chavanke
Business Analyst - Chemicals

Akash is involved in improving the granularity of integrated aromatics and olefins derivative markets. He previously spent one and half years at Prismane Consulting in Pune, where he worked on projects related to specialty polymers, bulk polymers, petrochemicals, bio-plastics and inorganic chemicals. Akash holds a B.Tech degree in Petrochemical Engineering from Maharashtra Institute of Technology, Pune.



Brian Leonal
Editor – Chemicals Asia

Brian Leonal is the Asia-Pacific editor of Argus' petrochemicals desk. He has nine years of experience in the hydrocarbon industry. Before joining Argus for the second time, he was a corporate banker in DBS Bank covering oil and gas as well as petrochemical markets. He has been involved in a diversity of transactions, including asset-backed, project, trade, and M&A financing, as well as clean corporate loans. He started his career in Argus in 2015 as part of the petrochemical team, with exposures to olefins, aromatics, and polymers.



Registered office

Lacon House, 84 Theobald's Road,
London, WC1X 8NL
Tel: +44 20 7780 4200

ISSN: 2399-939X

Copyright notice

Copyright © 2024 Argus Media group

All rights reserved

All intellectual property rights in this publication and the information published herein are the exclusive property of Argus and/or its licensors (including exchanges) and may only be used under licence from Argus. Without limited the foregoing, by accessing this publication you agree that you will not copy or reproduce or use any part of its contents (including, but not limited to, single prices or any other individual items of data) in any form or for any purpose whatsoever except under valid licence from Argus. Further, your access to and use of data from exchanges may be subject to additional fees and/or execution of a separate agreement, whether directly with the exchanges or through Argus.

Trademark notice

ARGUS, the ARGUS logo, ARGUS MEDIA, ARGUS OLEFINS OUTLOOK, other ARGUS publication titles and ARGUS index names are trademarks of Argus Media Limited.

Visit www.argusmedia.com/Ft/trademarks for more information.

Disclaimer

The data and other information published herein (the "Data") are provided on an "as is" basis. Argus and its licensors (including exchanges) make no warranties, express or implied, as to the accuracy, adequacy, timeliness, or completeness of the Data or fitness for any particular purpose. Argus and its licensors (including exchanges) shall not be liable for any loss, claims or damage arising from any party's reliance on the Data and disclaim any and all liability related to or arising out of use of the Data to the full extent permissible by law.

All personal contact information is held and used in accordance with Argus Media's Privacy Policy <https://www.argusmedia.com/en/privacy-policy>

Publisher

Adrian Binks

Global compliance officer

Vladas Stankevicius

Chief commercial officer

Jo Loudiadis

President, Expansion sectors

Christopher Flook

SVP Chemicals

Chuck Venezia

Customer support and sales:

support@argusmedia.com

sales@argusmedia.com

London Tel: +44 20 7780 4200

Houston Tel: +1 713 968 0000

Singapore Tel: +65 6496 9966

