

New supply chains

Chemicals companies must design new supply chains with resilience and carbon as key elements. Building a 'digital twin' of end-to-end supply chains can identify risks

Joseph Chang Location

In today's new world of supply chain disruptions coming from pandemics, weather events and shortages in labour and materials, chemicals companies must factor in resilience and carbon as critical elements in designing new supply chains.

"In this whole supply chain area, in the next few years, we're going to see tremendous change and tremendous dislocation which is an opportunity for all of us to gain competitive advantage - to get ahead of it," said Prakash Chandrasekar, managing director at Boston Consulting Group (BCG), at the Young & Partners Senior Chemical Executive Conference in New York.

While the COVID-19 pandemic gave supply chains a jolt with ripple effects across the world and across multiple industries, long-standing factors in company supply chains exposed their vulnerability in a time of crisis.

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"If you go back to just-in-time (JIT), and super efficient supply chains across all industries that evolved in the last two decades, they were primarily driven by globalisation, commoditisation, incredible transportation infrastructure and the drive for cost and efficiencies [with] information technology a key enabler as well," said Raj Gupta, chairman of automotive parts supplier Aptiv.

Gupta is also the former CEO of US-based specialty chemicals company Rohm and Haas.

Companies also took advantage of labour cost arbitrage and moved to asset light models by moving production as well as skilled labour abroad. This led to a significant increase in complexity, single sourcing of products along with exposure to geopolitical risk across the board, he noted.

When the pandemic hit in early 2020, leading to a demand collapse in Q2 followed by a dramatic stimulus-led resurgence in Q4, this "exposed the underlying weakness of the supply chain to complexity, labour disruptions and shortages, overload of shipping infrastructure and unexpected natural disasters. And the result was a substantial increase in cost and disruption in the supply chain", said Gupta.

For years, in the drive to boost efficiency, companies built larger plants, sourced from lower cost countries, and built JIT models with reduced working capital.

"All of these different levers when taken in isolation were good. But when you added them up, the supply chain across the system became more brittle and less



Super-efficient supply chains turned out to be brittle

capable of absorbing exogenous shocks that set off a chain of events across industries," said Chandrasekar.

"Frankly it's been this way for several years and it took a combination of factors like COVID-19, the Texas freeze, and the storms [on the US Gulf Coast] to really bring this issue to the forefront and expose the fundamental weakness present in our supply chains," he added.

Adding resilience

Now more companies are consciously designing new supply chains with resilience as a core aspect.

"What we're seeing now more and more is that companies are taking a highly analytical approach to intentionally design resilience into the system so that it can absorb these external shocks," said Chandrasekar.

"Be willing to take on some additional cost - instead of relying on one source, have multiple sources, recognising that some will be high cost - all in the mix of designing supply chains to have more resilience," said Gupta from Aptiv.

In the automotive sector, a number of OEMs (original equipment manufacturers) have discussed taking semiconductor production in-house, he noted.

"In the auto industry, it's older technology - it is not the latest technology in semiconductors that's used in car manufacturing. So one of the things they're doing is trying to get self-reliance in their own shop," said Gupta.

Companies are also working on developing greater transparency of information between customers, the company, and suppliers to improve the reliability of demand forecasts in collaboration with supply chain partners, rather than relying on the salesforce. "Even if you increase accuracy by 20%, 30%, 40%, you can have a dramatic impact on customer satisfaction, resilience of the supply chain, as well as cost," said Gupta.

A 'digital twin'

To gain visibility into risks in the supply chain and weigh their economic impact, companies should build a "digital twin" of their end-to-end supply chains - from every



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supply point and even suppliers' suppliers, to manufacturing plants to inventory buffers and customer ship-to points, and taking into account all the modes of transport and ports used.

"It's essentially a virtual depiction of your physical supply chain as it exists today. It allows you to simulate at a very granular level the economic impact of any number of events – so if there was a force majeure at one of your supplier locations, what would that do to your operation? Or if there was a Gulf storm or congestion at one of the ports, what would be the ripple effects be?" said Chandrasekar from BCG.

"It gives your team the ability to not only quantify risk but allows you to frame a business case for risk reduction initiatives. In the past it was harder to do, when you had an uneasy feeling, but you really couldn't put dollars next to that," he added.

"We need to prepare for a world where carbon reporting becomes as important and rigorous as financial reporting. And that world is coming"

Carbon critical

The second critical element in new supply chains is carbon. Companies have to assume there will be a price on carbon in the near future, and this has huge implications for the supply chain.

Whether a price on carbon comes in the form of an emissions trading system (ETS), a carbon tax or carbon border adjustment mechanism (CBAM), and whether the price is consistent globally or varies region to region, companies must be prepared.

"This is an issue coming at us very rapidly... So I would urge you to think through what a world with carbon pricing and CBAM could mean for your supply chain going forward, because it's going to be bumpy – even more bumpy structurally than what we've experienced in the past 18-20 months," said Chandrasekar.

"And does it create a market opportunity for you in some areas where competitors from other parts of the world may no longer be able to supply that region, or does it create a risk for you?" he added.

Scope 3 emissions and traceability

Companies will need to provide traceability of products across their supply chains and be able to allocate carbon emissions down to individual product lines if they are importing into markets with prices on carbon.

Quantifying Scope 3 emissions, which encompasses emissions from suppliers upstream, and logistics and end-of-life emissions downstream, will be very complex and challenging.

"It is very complex with hundreds if not thousands of suppliers who are all in various stages of their own net-zero journey, and it's a moving target because as your suppliers take action, your baseline changes, and it has to be constantly updated and refreshed," said Chandrasekar. "This is another area where analytics can play a significant role because we need to prepare for a world where carbon reporting becomes as important and rigorous as financial reporting. And that world is coming." ■

Think Tank

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Mideast, Asia PX suppliers target US

With China becoming more self-sufficient in feedstock paraxylene (PX) for its vast polyester industry, suppliers in Asia and the Middle East are increasingly seeking other export destinations. The US is an attractive option, featuring strong demand into packaging end uses.

Asia contract talks continue for 2022, with bearish pressure as a result of massive new Chinese capacity and softer demand.

US PX contracts for November are yet to be settled, amid recent volatility in upstream prices and high refinery rates.

With more than half of domestic PX production leaving the country, the US imports about half of the needed feedstock for its polyethylene terephthalate (PET) capacity, mostly on the east coast, distant from Gulf Coast PX production.

Historically, the Netherlands was most likely to be the source of these imports, but in the past three years, India and Saudi Arabia have been the top origins.

In 2019, North America received less than 2% of total Middle East PX exports, with northeast Asia receiving 71%, according to the ICIS Supply and Demand Database.

Since the beginning of 2020, however, the US share has been around 10% while China's share has dropped to around 50%.

Through September 2021, Saudi

and Indian material represented nearly 70% of total US PX imports.

Downstream production is ramping up in Mexico and Brazil, following mechanical issues, helping demand for US PX to rebound.

Overall, robust demand for PET across the Americas persists, keeping inventories low and run rates high for intermediate purified terephthalic acid (PTA), and sustaining PX consumption.

Americas PET production centres on packaging, such as bottles, while fibre production takes place largely in Asia.

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About half of US PX production is exported, with Mexico and Brazil combining to receive 96% of total US PX exports - 86% and 10%, respectively - according to the ICIS Supply and Demand Database.

The US supplies 96% of Mexico PX consumption, and half of Brazil's.

In 2021, China started more than 4.5m tonnes/year of new PX capacity, with an additional 6m tonnes/year expected to start up in 2022. China represents 75% of the world's total PX consumption.

US PX, xylenes

