

FIVE LESSONS FROM THE COVID-19 PANDEMIC FOR INDUSTRIES LEANING ON CHEMICAL SUPPLY CHAINS

The chemical industry contributes \$5.7 trillion to the world's gross domestic product, according to the European Chemical Industry Council¹ and supports 120 million jobs. The chemical industry is large, but its footprint is even bigger. Industries including pharmaceuticals and biotechnology, cosmetics, food and beverage, and nutraceuticals depend on chemicals. As a result, disruptions in chemical supply chains can cause chaos across those industries. The COVID-19 pandemic has brought home many key lessons about managing these challenges.

First, though, let's review how we got here. While many industries rely on chemicals as their lifeblood for innovation and production, the supply chain



The impact of COVID-19 on the chemical supply chain exacerbated many challenges the industry already faces. The good news is that the lessons learned have taught us that efforts in supplier relationships, inventory management, and data-driven decisions can mitigate the impact from future global events.

has been confined to just a few regions. Over the past 2 decades, Asia has formed the locus of the world's chemical industrial plants and warehouses, says Ravi Sethi, vice president of consulting for GEP Worldwide.² By 2030, Asian entities will make up two-thirds of all chemical supply chains. China and India combined manufacture 70–80% of the world's off-patent active pharmaceutical ingredients (APIs), according to the European Fine Chemicals Group.³

Understandably, when COVID-19 spread globally, the chemical industry felt a disproportionate impact, Sethi says. The pandemic caused unpredictable delays in production, which in turn led to logistical challenges such as congestion at ports, he adds.

The pandemic has laid bare many challenges in the chemical supply chain: the need for greater transparency, the flaws of just-in-time inventory management, and the overreliance on certain regions for raw materials and manufacturing capacity. The protocols the industry must abide by, like strict regulations and oversight, exacerbate these challenges.

“Despite the roadblocks, there is reason for hope. Even before the crisis, the [biopharmaceutical] industry had been undergoing significant, steady advances,” Eric Langer, managing partner at BioPlan Associates, writes in a white paper he coauthored.⁴ “The industry has learned to be flexible and to adapt quickly to change.”

The experts interviewed for this feature all agreed that the chemical industry had been turning toward more resilient supply chains even before the pandemic. Concerns about far-flung production sites and the ability to leverage digital technologies had been moving the needle, Sethi says. But COVID-19 baked in key lessons. Here are five about the supply chain that the chemical industry has learned.

LESSON 1: THE SUPPLIER MANAGEMENT RELATIONSHIP NEEDS A REBOOT

One of the most vital lessons of the pandemic is the importance of supplier management, according to Myles Payne, chief financial officer at Spectrum Chemical. “You don't want to be waiting in line for product from your supplier when demand exceeds their supply,” Payne says. Rethinking the connection is going to be critical to the health of the supply chain.

That redefined relationship can manifest in more robust order forecasts, Payne says, so suppliers know what's coming months in advance. “We are finding better ways to listen to our suppliers and understand their pain points. A lack of forecasts, inconsistent ordering patterns, lack of confirmation of quotes—these are all problems that we are actively addressing so we can speed delivery of raw materials to our customers,” he says. Chemical companies large and small benefit from establishing firm supplier agreements and nurturing relationships for the long run. Midtier suppliers are also extremely helpful to have on your side, according



The pandemic forced the chemical industry to rethink the “just in time” approach to inventory supply. Here, a Spectrum Chemical associate in the New Brunswick, NJ facility prepares a package for shipment.

Image credit: Spectrum Chemical

to Payne. With top suppliers, he says, “you might be a pretty small fish in a very big pond, so you’ll likely get lost.” That also applies to direct customers, in which service, response times, and visibility may increase appreciably for those representing a larger portion of a supplier’s business.

“One of our sweet spots is meeting the needs of smaller and midsize customers that are often overlooked by larger suppliers,” Payne says. “We remain nimble in this area, and we have the scale and relationships to serve larger organizations too.”

To strengthen the supplier network through multiple tiers, Spectrum Chemical is turning to official sources of information. It has subscribed to Cortellis, a database of over 70,000 suppliers of APIs.

It isn’t just the supplier relationship that needs a rethink. “The pandemic taught us that if you don’t have established backup carriers with good pricing, logistics could be an issue,” says Kurt Rodebaugh, vice president of global operations at Spectrum Chemical.

Paige Morse, industry marketing director for chemicals at Aspen Technology, believes collaboration up and down the supply chain will be key in the future. “Value chains need to talk, and you want to be efficient at every step,” she says. “You need an environment where companies can share data and come up with better solutions.” Data platforms, which make it easy for companies to share information and collaborate on large projects, are going to be vital to agility in the supply chain.

LESSON 2: IT'S TIME TO RETIRE JUST-IN-TIME INVENTORY

For years, chemical companies chanted the just-in-time mantra, says Sethi at GEP. The inventory management approach mandated that companies have just enough material on hand to function, to avoid tying up capital in idle stock. The pandemic dramatically exposed the problem with such a strategy. Both demand and supply were affected, Accenture reports: “For the chemical industry, such challenges are compounded by the fact that its customer industries, such as automotive and electronics, are deeply affected by plant shutdowns and the disruption of sales channels.”⁵

“There was no redundancy because redundancy costs money. But what happens if your production is shut down for a month and you lose a year’s profits?” Sethi says. “Companies have recognized that they have to sacrifice some efficiency to build in redundancy,” he adds.

The moral of the story: have some cushion in inventory.

This is also true for biopharma. Given that it may take years to qualify a source in that subsector, inventory redundancy is a good idea. Governments are recognizing that stockpiling essential supplies for drug manufacturing is a national security issue.

Redundancy also provides a cushion against risk, according to Rodebaugh. “The industry needs to build in redundancy in multiple areas: you have to train additional staff, establish relationships with more suppliers, more logistics companies,” he says.

Reenvisioned inventory management is also about redesigning the warehouse, Rodebaugh says. Spectrum Chemical is looking to rework its warehouses for optimal layout that will make picking and packing orders more efficient.

LESSON 3: WE NEED NEW WAYS OF ASSESSING AND MANAGING RISK

The goal of building an inventory cushion is to reduce supply chain risk.

The pandemic made the industry see the need for resilience, Sethi says. Morse agrees. “Chemical companies have learned that they have to integrate the concept of volatility into their models,” she says. “They’re asking, ‘How do we build agile businesses that can respond effectively to this volatility?’” It’s not as if supply chain risk mitigation is new, but the pandemic drove the point home.

“The pandemic was a classic example of multiple weak signals of risk,” says Sethi, who adds that the difficulty is knitting these multiple weak signals together to develop a coherent picture one can act on. Technology is emerging that can help with such challenging risk assessments.

Chemical companies are turning to artificial intelligence and machine learning to help them make smart decisions in a volatile, risky world. Machine-learning



Like many companies, Spectrum Chemical was required to adjust how workers operate throughout the warehouse to accommodate new social distancing guidelines during the pandemic. Here, Spectrum Chemical warehouse associates review these changes at the Gardena, CA facility.

Image credit: Spectrum Chemical

models like those developed by Dataminr can trawl the internet to pick up multiple weak signals, act on real-time data, and alert firms about potential disruptions. For example, Sethi says, the models can incorporate event data—for instance, a fire in Malaysia. The country is a large supplier of palm oil, he says, and the algorithm could advise about alternate sources to avoid delays.

Wendy Tate, a professor of supply chain management at the University of Tennessee, Knoxville, says the chemical industry is learning to expand the use of data analytics and digitalization for better transparency and risk management. “Supply side mapping of networks, suppliers, locations, flows of materials to determine when the next disruption occurs, and how risk can be mitigated is high on the corporate agenda,” Tate says.

The capacity for risk needs to be assessed against the particular challenges of the industry’s subsectors. Biopharma, for example, depends on many ingredients for production. Early stages of a drug might be completed by a contract manufacturing organization (CMO). Another wrinkle, according to Rodebaugh: this subsector must also meet the stringent demands of good manufacturing practices (GMP). These protocols ensure pharmaceuticals are pure and work only as advertised.

The industry is also learning that understanding geopolitics and the global supply chain’s interconnectedness matter when you are looking to account for risk. The US tariffs on China were an alert about the importance of geopolitics,⁶ and the pandemic underscored the globalization of the supply chain, Sethi says. COVID-19 regulations that evolved in response to fluctuating local conditions

adversely affected production and manufacturing. The resulting problems rippled down the supply chain.

For instance, during the pandemic, the government of India placed restrictions on the export of 26 pharmaceuticals,⁷ and the nation was affected by bans on imported vaccine raw materials.⁸ Such calculations will also have to form the framework for risk assessment, according to Sethi, and issues such as shifting geopolitics and policies of different administrations keep supply chain managers up at night. “These are hitting the chemical industry and are smack in the boardroom agenda,” he says.

LESSON 4: THE INDUSTRY NEEDS TO FIGURE OUT WHO WILL MANUFACTURE GOODS—AND WHERE

Companies have learned that they need to play to their strengths and trust in CMOs as destinations for outsourced projects, BioPlan’s Langer writes in a white paper.⁴ “Use of CMOs and other outsourcing will continue to accelerate,” he says.

The pandemic showed that an overreliance on raw goods from far-flung regions of the world can seriously disrupt the supply chain.⁹ The upshot is that the industry is aware of the increased need for regional or local manufacturing and distribution. “This is now seen as essential to deal with any future pandemics,” Langer writes.⁴ For example, the paper states, suppliers expect to build more equipment capacity in the US for the US market and in China for the Chinese



One of the lessons learned during the pandemic was to have more cushion in inventory. Here, a Spectrum Chemical associate checks stock to fill an order at the Gardena, CA facility.

Image credit: Spectrum Chemical

market. Manufacturing might be “more internationally disseminated to increase flexibility and manufacturing redundancy,” it adds.

Local production and distribution also save on transportation and logistics costs—an added bonus of this shift. Spectrum Chemical’s Rodebaugh points out that his organization leverages three worldwide locations, including two bicoastal facilities in the US as well as one in Shanghai. The US facilities are Food and Drug Administration-registered. All the locations have ISO 9001:2015 certification and include ISO class 8 clean rooms for packing, as well as laboratory testing facilities staffed with professional chemists.

The focus on sustainability is also behind the localization trend. Sustainability and the green premium are fast becoming points of conversation in the supply chain, Aspen Technology’s Morse says. Though chemical companies traditionally might have built out supply chains primarily based on cost, footprint and sustainability are now considerations. “Source things from far away, minimal inventory was the practice,” Morse says. “Now companies are rethinking this. ‘How can we get our raw materials somewhere closer? Can I encourage my key supplier to build a plant closer to me?’ The industry is exploring alternatives.”

LESSON 5: THE PATH TO RESILIENCE WINDS THROUGH DIGITIZATION

Companies are learning that data-driven decisions—through digital transformation—will be necessary to build a supply chain sufficiently resilient to withstand another shock like COVID-19. “The last 25 years alone have yielded so much data,” Sethi says. “The key is to mine the right information from this data.”

Spectrum Chemical’s Payne agrees. “One of the big lessons we have learned is that digitalization delivers scalability,” he says. Companies recognize they need a digital ecosystem to process orders quickly. “Do you have the supply chain relationships in place? Do you have the capacity to do the quality testing? Manual processes are probably the biggest barrier to scalability. You need to be sustainable when you take on large volumes,” Payne says.

The biggest attraction of digital transformation is that it paves the way for more advanced technologies. Expect AI and machine-learning models to deliver efficiencies up and down the supply chain, from risk assessment to scenario analysis. Morse points out the value of digital tools, including AI, that enable companies to run scenario analyses. Such tools help companies measure twice and cut once. “They can put together alternative scenarios and then look at how that impacts [supply chains] and financials,” Morse says. Carbon production and energy consumption can also be included in such evaluations.

Pratik Bhatia, a scientific logistics analyst for the chemicals and pharmaceuticals vertical at Logistics Plus, is also excited about blockchain, a digital ledger of transactions. The promise of a supply chain secured by blockchain is that every contract is auditable, traceable in seconds, and, most important, unchangeable, which leads to transparency and accuracy. Given that 250,000 children die each year

after being treated for malaria or pneumonia with fake medicines, Bhatia says, the impact of supply chain transparency through this technology can be radical.¹⁰

The University of Tennessee's Tate is impressed by product and process innovations made during the pandemic to help mitigate supply chain risk and disruption. Many companies and industries put small teams in place to take ownership of problems and gave the teams resources and support, she says. For example, when personal protective equipment became scarce or unobtainable, many companies pivoted to make their own. Other outsourced products "suddenly had to be insourced," Tate says. Diversity and inclusiveness of teams and suppliers helped enable innovation and agility, she adds.

That said, innovation alone cannot save the bottom line in the future.

CONCLUSION

The biggest takeaway? Don't forget the lessons learned. "It's cliché to say it, but you cannot let a pandemic go to waste," Sethi says. Whether it's demand-sensing systems or digital supply networks or risk assessment machine-learning models, the key takeaway is that the industry has realized the need to move toward data. The question it all boils down to, Sethi says: "How do we get to the digital enterprise?"

Payne thinks we may already be there. "More than 90% of the world's data has been created in the last 2 years," he notes. "That's a good indicator that we can make more fact-based decisions to further innovate and improve supply chains. After all, the very definition of chemistry is the science of how properties interact and change. Practically speaking, that also applies to those of us who are leading the chemical supply chain itself."

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