

SUPPLY CHAIN DISRUPTIONS: HOW TO PREPARE

In the last 5 years, the world has navigated geopolitical and economic events, which have accelerated the shift towards regional sourcing and highlighted the need for greater supply chain resilience.

The Covid-19 pandemic was a force majeure event for many, while for others, hot conflicts and natural disasters have upended the status quo for their raw materials supply chains. Although the main effects of the pandemic have abated, new trade relation stressors have kept some supply chains fragmented and fragile.

Procurement departments have struggled with headwinds, both old and new, witnessing a decline in supply chain stability. **The main factors affecting the stability of supply chains are order fulfilment lead times, transportation costs, raw material costs, and trade barriers.**

Between 2014 and 2024, the average lead time for raw materials internationally has increased by approximately 17%, from around 60 days to 70 days, influenced by global supply chain disruptions, as indicated by trends in the *ISM Supplier Deliveries Index* and industry reports. This is pressuring producers and forcing them to maintain increased inventory levels that are inefficient, or risk potential shortfalls.

As with lead-time impacts, the cost of international shipping has not rebounded either. Between 2014 and 2024, global container freight rates increased by approximately 138%, rising from an average of \$1,400 per 40-foot container in 2014 to \$3,331 in November 2024, according to the *Drewry World Container Index*.

GLOBAL CONTAINER FREIGHT RATE (AVG)

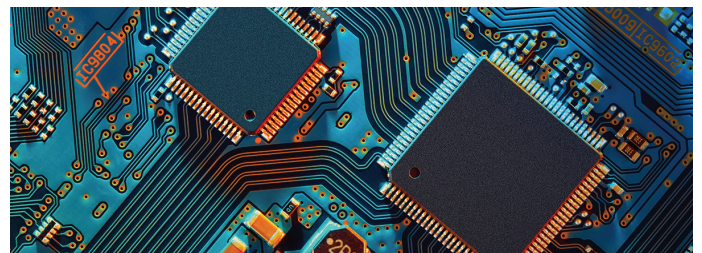


Geopolitical instability and the impact on the insurance portion of shipping costs, not to mention increased port fees due to labour shortages and modernisation plans, has caused purchasing managers to reassess the landed cost of goods, making once premium-cost options more competitive.

The current trade and tariff environment is unlike anything we have experienced for several decades. Although it is unclear how the situation will play out, we can be certain that at least

in the short term, we should expect potentially serious supply chain disruptions and re-alignments. Nearshoring and regional sourcing will be key strategies for companies that look to safeguard their supply of key materials needed for production. Manufacturers are likely to incur a financial burden with an increase in the expected average cost of goods, while facing a potential plant reconfiguration to cope with a non-standard supply.

In 2023, the global supply of tin (a solid metal widely used in electronics manufacturing) faced significant disruption due to production halts in Southeast Asia. Myanmar, a key tin producer, introduced export restrictions amid political instability, while Indonesia, the world's largest tin exporter, tightened mining regulations, reducing its output. As a result, tin availability dropped sharply, and prices surged by nearly 25% in early 2024.



Tin is critical for soldering in electronics, particularly for producing circuit boards.

Major manufacturers like Samsung and Foxconn, who depend on tin for their production lines, were directly affected. To keep operations running, these companies sought alternative suppliers, turning to smaller tin producers in Africa and South America. Some also ramped up recycling efforts to extract tin from scrap materials, while others explored using substitute alloys, though this required tweaking their manufacturing processes.

This disruption underscored the risks of relying on concentrated supply sources for essential materials like tin, pushing manufacturers to adapt quickly and diversify their sourcing strategies.

For manufacturers using dry powdered and granular materials in industries like food, pharmaceuticals and chemicals, maintaining a consistent supply is critical to ensuring product quality, safety, and regulatory compliance. Disruptions can halt production, inflate costs, and damage customer relationships. To navigate these challenges, manufacturers must implement proactive strategies that integrate resilience and flexibility into their operations.

FIVE PROACTIVE STRATEGIES

1. PLANNING FOR DISRUPTIONS AND ADJUSTING INVENTORY LEVELS

Supply chain disruptions can occur unexpectedly, making proactive planning essential. Manufacturers should leverage data analytics and forecasting tools to predict potential risks. For critical dry powdered and granular materials (e.g., flour, powdered chemicals, or cement additives), maintaining a safety stock is key to avoiding production stoppages. However, to balance cost and risk, less critical items can be managed with just-in-time inventory. Since these materials often require specific storage conditions, such as moisture control to prevent clumping or degradation, **manufacturers must ensure their facilities are equipped to preserve material integrity during extended holding periods or have systems on hand to re-condition the product into a suitable consistency.**

2. FINDING DIVERSIFIED ALTERNATIVE SUPPLIERS

Relying on a single supplier or region heightens vulnerability to disruptions. To mitigate this, manufacturers should identify and qualify multiple suppliers, both locally and from distant regions. This diversification reduces dependencies and facilitates a steady flow of materials. When selecting alternatives, focus on a supplier's reliability and shared quality standards. Note an ability to deliver dry powdered and granular materials with consistent properties, such as particle size, purity, and flowability, since variations can disrupt processing and affect final product quality. If the target level of material consistency is not obtainable within the options you have available, further steps will be needed to adapt your plant to cope with the product variation.

3. PLANNING FOR ALTERNATIVE MATERIALS AS SUBSTITUTES

When primary materials become unavailable, substitutes can keep production running, but they must meet strict quality and performance criteria. **Manufacturers should invest in research and development to identify and test alternative materials ahead of time, conducting trials to confirm compatibility with existing products and processes.** For dry powdered and granular materials, substitutes might differ in density, flowability, or reactivity. It's crucial to verify that these alternatives work with current handling systems (pneumatic conveyors, bulk storage and the like) and do not introduce consistency issues, ensuring seamless integration into production.

4. ENSURING PRODUCTION EQUIPMENT IS READY FOR CHANGES

Production plants must be equipped to handle new or varied materials without compromising efficiency or quality. This requires designing equipment with flexibility, such as modular systems, appropriate safeguards (e.g., metal detectors or sieves), and adjustable parameters (e.g., throughput or flow promotion). For dry powdered and granular materials, storage vessels, conveyors, and blenders should accommodate different particle sizes and flow properties. Additional features, like lump breakers or dehumidification systems, may be needed to manage material behaviour changes. Regular maintenance and calibration further ensure readiness, minimising downtime during transitions to new ingredients or consistencies.

5. UPGRADING SYSTEMS IN ADVANCE FOR RESILIENCE

Modern technology enhances a manufacturer's ability to adapt to supply chain shifts. **Investing in flexible manufacturing systems that have adaptability at their core enables a quick response to disruptions. Systems can be engineered with the right guidance to handle an array of products, and where needed, can be configured to allow low-cost low-down time modifications to suit incoming product changes.** Advanced planning systems, like ERP with scenario modelling, allow manufacturers to simulate and prepare for material shortages or changes. For dry materials, sensors can track moisture levels or flow rates, alerting operators to deviations, while automated systems adjust processing parameters on the fly. Planning and installing these upgrades ahead of time builds operational agility.



Although this is a trending and widespread issue today these challenges have existed, albeit in a much more dilute form, since mass manufacturing was adopted. Flexicon has witnessed many of these through the eyes of its customers and helped to remedy the problem, often after it has already occurred and caused significant production challenges and slowdowns. We have also used these lessons to help guide new customers that are modifying existing production lines or creating brand new facilities, engineering in low-cost flexibility and contingencies wherever necessary.

With this as one of the drivers, Flexicon has developed a range of modular options, including augmenting storage capacity, allowing for quick reconfiguration to contend with changes to raw material supplies, or an adapted process. An example of this is Flexicon's Flexible Screw Conveyor that can be supplied with a no-tool-required quick release spiral coupling, enable production staff to quickly and safely change spiral profiles to suit a change of product being conveyed. This can be a drastic time saver when swapping between a powdered to granular form of the same ingredient or using a variable frequency drive to allow the same weight per hour transfer even if the product's density fluctuates.

Often the biggest issue for process equipment is how a product flows into and out of storage vessels, Flexicon are well well-versed in this and can engineer vessels with attributes that handle a variety of products.

Solutions include the incorporation of flow promotion devices that can be cycled on or off depending on the specific product's requirement; or something as simple as allowing for correctly placed mounting locations and electrical controls contingencies in the electrical program design for flow promotion devices. This may exchange a modification once requiring significant cost and production downtime, for a plug-and-play modification that a maintenance team can perform in mere hours during a production run.

Another example of modular designs that can adapt to new realities on the ground is Flexicon's Tubular Cable Conveyor lineup. These can be easily modified to include extra inlets/outlets and routing at very low cost and often without any welding or hot work requirements. This allows for the expansion of storage vessel location and numbers, meaning inventory levels can expand without having to throw out existing transfer systems and start from scratch at significant cost and down time.

Another focus of Flexicon is to enable manufacturers to cope with the reality of a product that is not in a condition their process equipment can handle. A legacy plant is often expensive to reconfigure, making the ROI hard to justify for a single input variation. In these instances, conditioning the product to make it suitable for the existing system is often the most cost-effective solution.

Flexicon can integrate an inline product conditioning device such as a de-lumper into existing transfer system, modifying a product's particle size to something more suitable. Also, we can recondition a hygroscopic product that has agglomerated in a bulk bag after incorrect storage or adverse shipping conditions, using a standalone or integrated bulk bag conditioner that breaks the product back down to its intended particle size, allowing it to flow more easily into the downstream process.



Bulk Bag Conditioner

Control systems are another point in the production facility where manufacturers can engineer in flexibility. Flexicon's in-house electrical engineers and programmers specialise in creating a customised control system that suits your specific challenges, providing operators real-time feedback and adjustable parameters to meet the reality of the moment. When product moisture levels fluctuate, flow promotion regimes need to be adjustable to suit. If a new product needs to feed into an extruder at a faster rate, then the control system needs to allow for adjustment flexibility without

a programmer's involvement. All these considerations and more can be engineered into the initial design, meaning that, where appropriate, a line supervisor or the operator can adjust any part of the system that may be affected by irregular supplies of raw material.

Whether designing a greenfield production facility or evaluating and upgrading existing production plants, Flexicon will draw from the depth and breadth of experience gained from over 50 years of exposure to bulk solids handling industries across the globe. We specialise in handling dry, granular, and powdered raw materials of all types and have teams of dedicated engineers (focused on every major global market), who are ready to help you tackle any related issue a manufacturer may be confronted with.

In an era of volatile supply chains, manufacturers of dry powdered and granular materials must prioritise resilience. Disruptions are inevitable, but their impact can be mitigated through proactive planning, diversified sourcing, substitute preparedness, equipment adaptability, and system upgrades. These strategies demand upfront investment in time and resources, but they are essential for maintaining production continuity, ensuring product quality, and staying competitive in an uncertain world.

NAVIGATE SUPPLY CHAIN DISRUPTIONS

Flexicon APAC Provides Strategies for Resilience

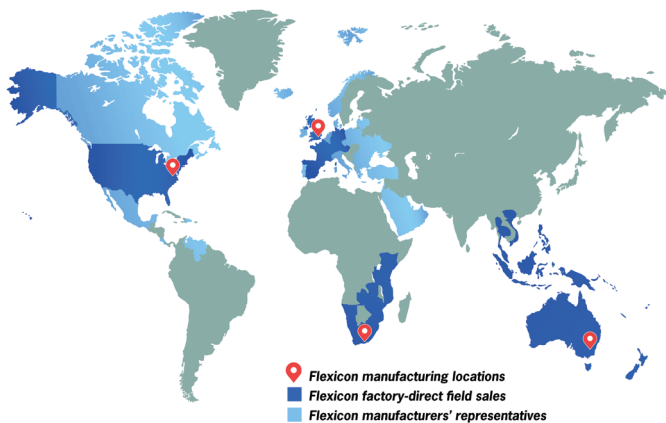


Make adaptability a core component of your process

Integrate modular systems to ensure uninterrupted production and maintain quality

Back it all with a Lifetime Performance Guarantee

Scan the QR code to hear more on how Flexicon APAC can help safeguard your production lines and enhance your operation. (3 min. video)



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