

# 5 Strategic Approaches to Mixing Technologies in 2025: Navigating Global Manufacturing Challenges

By Erin Dillon, Charles Ross & Son. Co.

The manufacturing landscape in 2025 is undergoing rapid transformation, and the decisions made today will have lasting impacts for decades to come. From unpredictable supply chains to skilled labor shortages and rising material costs, manufacturers across the process industries are confronting a never-ending list of challenges.

Since 2020, raw material shortages and sourcing disruptions have become the norm, while tariffs and trade restrictions only add fuel to the fire, making certain materials both costly and difficult to obtain. Inflation has further complicated matters, driving up costs across materials, transportation, and energy. At the same time, surging demand for essential goods—such as pharmaceuticals, food, and tech products like batteries and cellular phones—has placed unprecedented strain on already overloaded production lines.

To make matters worse, many manufacturers are struggling to attract and retain skilled workers, pushing staff and equipment to their limits. With inefficiencies now less tolerable than ever, businesses must prioritize solutions that boost productivity, streamline operations, and reduce waste. In this high-pressure environment, optimizing mixing technologies, control systems, and production processes is essential for maintaining product quality, meeting growing demand, and weathering the storm of economic and supply chain volatility.

To help address these challenges, manufacturers can consider five key approaches that focus on enhancing efficiency, improving resource management, and fostering innovation. These strategies not only provide immediate relief but also lay the groundwork for long-term resilience in an unpredictable manufacturing environment.

## 1. Partner with Manufacturers That Offer Testing Services Before Buying Equipment

Proper mixing is a cornerstone of efficient manufacturing. Inadequate or inconsistent mixing can lead to product defects, wasted raw materials, and extended production cycles—all of which can significantly impact profitability and customer satisfaction. Modern mixing equipment, such as high-shear mixers, ribbon blenders, and planetary mixers, are designed to address these challenges by providing superior control, energy efficiency, and scalability. By investing in the right mixing technologies, manufacturers can improve batch consistency, reduce material waste, and optimize throughput. But how do manufacturers choose the right equipment for their



Steep walled extension hopper for promoting mass flow

needs? One effective approach is partnering with equipment suppliers that offer testing and development services.

Scaling up batch sizes, sourcing alternative materials, and adapting to packaging changes require rigorous pre-purchase evaluation. By thoroughly analyzing mixer specifications such as tip speed, horsepower, agitator location, flow rate or batch turnover rate, and vessel characteristics, companies looking to scale up or modify their production can ensure that new equipment will align with their growing needs. Comprehensive testing services enable manufacturers to replicate production conditions, identify potential issues such as foaming or viscosity changes, and implement targeted process adjustments—employing powder induction technology or utilizing a vacuum system, for example. Testing identifies potential operational inefficiencies and helps ensure that investments in equipment are both practical and cost-effective. By thoroughly testing equipment with realistic materials and conditions, manufacturers can safeguard production targets and maintain financial performance.

For companies seeking flexibility without the full investment of purchasing equipment, renting a mixer can be an economical solution. At a fraction of the cost of purchasing, rental mixers enable engineers and scientists to test new process improvements in real-world production settings. Rentals also provide a valuable option for optimizing efficiency on the production line, whether it's scaling up production for a short-term project or testing equipment for a future purchase. A trial or rental program allows manufacturers to adjust capacity to meet fluctuating demand, without the financial commitment or delays associated with capital purchases.



ROSS control system

## 2. Optimize Cycle Times with Updated Control Systems

Optimizing cycle times through the upgrade of control systems is a vital step toward enhancing production efficiency. Modern control systems allow for real-time monitoring of critical parameters—such as motor load, temperature, and pressure—ensuring high repeatability and precision. A well-designed control system not only minimizes energy consumption but also reduces wear and tear on equipment, ultimately extending its lifespan and lowering maintenance costs. Additionally, systems that feature interactive phone and tablet configurations allow users to stay connected and make adjustments on the go, saving time and streamlining operations. These advanced systems can even be programmed to automatically send text or email notifications about operating status, production concerns, and alarms, offering on-demand visibility into the production process.

Automated recipe management systems further optimize efficiency by reducing operator errors and ensuring consistent batch quality. They also enhance safety by limiting operator exposure to hazardous chemicals and

extreme temperatures. However, even in simple, non-hazardous mixing operations, ensuring full compliance with safety codes goes beyond simply wiring the right motor starter or variable frequency drive. OSHA, NEC, and local regulations mandate the use of energy-isolating devices that can be locked out and bear visible warning tags to protect employees from the risk of unexpected startup or release of energy during maintenance or service work.

Moreover, predictive maintenance tools integrated into these systems can identify early signs of equipment strain, helping to prevent unplanned downtime. By adopting these advanced technologies, manufacturers can optimize cycle times, maintain product quality, and position themselves for sustained success in an increasingly competitive and fast-paced market.



Ross vacuum-rated high-speed disperser

### 3. Embrace High-Shear Powder Injection Systems

Supply chain disruptions often force manufacturers to work with alternative powders or raw materials that behave differently in the mixing process. Traditional mixing methods may fail to handle these challenges efficiently. A high shear powder injection system generates an intense vacuum in the high shear zone, drawing powders into a fluid stream (inline) or sub-surface (batch). Since solids and liquids are combined at the exact point where intense mixing takes place, these systems are capable of handling extraordinarily large volumes of solids without clogging or agglomerates.

Powders like carbomers or silica--already prone to clumping--become harder to process when packaging or storage conditions degrade material flowability. Alternative materials introduced to offset supply chain shortages may require higher shear to disperse properly. High-shear systems address these issues by preventing agglomerates or “fisheyes” from forming, thus reducing waste and improving consistency. Additionally, intense shear at the point of entry shortens cycle times, freeing up equipment for additional production runs and helping to meet increased demand.

### 4. Leverage Vacuum to Improve Quality

Mixing under vacuum provides a range of significant advantages, particularly for industries where product consistency and quality are crucial. One of the primary benefits is the elimination of air bubbles from the final mix, which can lead to voids, reduced strength, and texture issues in finished products. This is especially important in industries such as adhesives, food production, coatings, and composites, where even small inconsistencies can affect performance, appearance, shelf stability, and customer satisfaction. Vacuum mixing effectively addresses these issues by removing air from the process, ensuring that the final product meets density, uniformity and quality targets.

In addition to improving product consistency, vacuum mixing enhances several key properties.

For example, it improves the dispersion of pigments in coatings and paints for a more uniform color and better performance. In other products, vacuum is applied to remove oxygen and prevent decomposition of sensitive ingredients or thwart unwanted chemical reactions and microbial growth. Some gels and pastes are mixed under vacuum to prevent defects in syringe filling or print-

ing. Finally, vacuum mixing allows drying processes to proceed faster and at lower temperatures. This is an excellent method for drying heat-sensitive materials while managing the risk of thermal degradation.

Overall, incorporating vacuum mixing into certain production processes can drive improvements in product quality, operational efficiency, and profitability.

## 5. Partner with American Equipment Manufacturers for Fast Delivery & Rental Programs

Supply chain disruptions affect every stage of the manufacturing process, and equipment pro-

duction is no exception. Large-scale mixers, for example, require a diverse range of parts and components—metals and alloys, seals and gears, lubricants, oils, and computer chips, among others. American-based mixer manufacturers often

keep substantial inventories of ready-to-ship equipment, allowing companies to bypass long delays from overseas suppliers. Domestic manufacturers also offer faster service and support, with readily available spare parts and expert technical assistance, helping to minimize downtime and keep operations running smoothly.

By partnering with American equipment manufacturers, companies can better navigate supply chain challenges, maintain operational flexibility, and quickly address immediate production needs. This strategy helps ensure continuity in operations and also strengthens resilience in the face of an unpredictable manufacturing landscape.

### Final Thoughts

The manufacturing sector in 2025 is navigating a perfect storm of supply chain volatility, inflation, tariffs, and labor shortages—all while striving to meet growing demand. By adopting strategic approaches to mixing technologies, companies can mitigate these challenges and secure long-term success. Diligently reviewing existing procedures, testing new equipment, embracing innovations, and partnering with reliable domestic suppliers are some essential strategies for thriving in this demanding environment.

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