



White Paper Series

The 5 Catalysts for Automation Transformation in Manufacturing and Distribution

Topic 3: Supply Chain Disruptions



Shock and Yaw: How Material Handling Robotics Can Drive Supply Chain Resiliency

Material handling has undergone significant stress over the last few years, but the current crisis predates the pandemic. Most operations are still heavily-reliant on labor-intensive technology from the last century. With warehousing footprint expanding exponentially, now is the time to explore modern, flexible material handling automation to help respond to industry headwinds. This five-part white paper series explores each major catalyst for change in manufacturing and distribution, details their operations challenges, and covers how automation can help you overcome those headwinds and turn your response into a competitive advantage.

The past few years have seen major disruptions in the supply chain, ranging from [COVID-19 shutdowns](#) in Asian factories to the [Russian invasion of Ukraine](#) to manufacturing [shortages of baby formula in the U.S.](#) and [ongoing computer chip shortages](#) affecting multitudes of industries. These events, and others, are causing companies to realize that they cannot rely on a small number of offshore partners to maintain a critical supply chain.

In order to offset the unpredictability of smaller supply chains, companies are beginning to [diversify their supplier base](#), looking to re-shore or near-shore critical components closer, and searching for more flexible warehouse and storage options. However, many of these solutions offer their own complexities and challenges, including receiving and shipping orders on shorter notice, and staying competitive with low-cost overseas options.

Surrounding all of these challenges is a continuing labor shortage in many different industries, ranging from long-haul trucking to warehouse workers to factory welders, just to name a few.

In order to build a more resilient supply chain, companies need to diversify their suppliers as well as improve their internal supply chain operations. This can be accomplished through flexible material handling automation across the supply chain. Automation can lower costs for your suppliers, support reshoring efforts to be more competitive, and work intelligently and dynamically to respond to rapidly-changing order profiles. For example, as companies expand their SKU offerings due to customized product orders from customers, and as storage needs increase due to a shift away from just-in-time delivery, automation can help lower costs by eliminating non-valuable travel from reserve storage to point of use.

Companies are discovering **5 key benefits** to adopting material handling automation to reduce the disruptions of supply chain shocks and support a more resilient supply chain. Automation can quickly adapt to changing operations; enable flexibility and scalability through non-capital infrastructure; drive continuous improvement through increased data visibility; help retain and improve employee productivity; and reduce the reliance of continually searching for new workers. Let's uncover them in greater detail.

Reason 1: Automation adapts to changing operations

In traditional industrial automation settings, large machinery and robotics are used to support specific applications and tasks, such as a robotic assembly line constructing automobiles or large appliances such as refrigerators. Much of this equipment is purpose-built for those specific tasks, with processes that are engineered to fit the equipment, rather than the equipment serving the process. For any changes to a product's design, processes often need to undergo lengthy changeover times for the assembly line.

Flexible automation, however, is defined by the ability to adapt to changing processes and situations. As new lines get tooled and/or workflows and layouts change, the automation system changes along with it. For example, a factory employing autonomous mobile robots (AMRs) to help deliver parts and finished products can quickly change their routes should the plant layout change or new lines come online. This includes obstacle detection and dynamic route planning that helps the AMRs more efficiently perform their tasks in an ever-changing environment.

Having automation that can adapt to changing operations allows companies to switch gears quickly should supply chain disruptions occur. For example, an operation that produces parts for others can quickly scale up new lines more easily with flexible automation, providing an opportunity for new revenue from companies looking to address the part shortage.

Other examples of flexible automation include bin-picking robots that are able to “learn” new objects to pick and place, improving their speed and accuracy thanks to artificial intelligence and machine learning algorithms. New low-code interfaces allow workers to repurpose and retrain collaborative robot arms to perform new tasks as needed, such as switching from a bin-picking robot to a screw-driving task, or even parts welding. Many new collaborative robots, sometimes called co-bots, can be installed without needing additional safety fences or permanent infrastructure.

Much of this rapid repurposing and reconfiguration is powered by software improvements, which enables over-the-air software updates to enable greater agility and driving continuous improvement for next-generation robotic systems.



Reason 2: Automation enables flexibility and scalability

In traditional automation deployments, there is a fixed output and systems take between one and three years from the start of planning to a full installation, which includes large capital purchases of equipment. In today's environment, this is unacceptable considering the need for low-volume, high-mix production.

Modern flexible automation systems, however, can be installed without requiring a massive infrastructure change. They can be installed in a matter of days or weeks. In addition, the systems can be reconfigured and scaled up or down as needed, adapting with a growing company instead of impeding it. The flexibility of the systems also allow for easier relocation or expansion to new facilities as companies grow.

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Manufacturers interested in producing a higher mix of products can take advantage of supply chain disruptions by producing in-demand products for customers, ramping up or down production as demand changes. Because flexible automation allows for modular floor layouts and the ability to quickly recalculate mobile robot paths, this becomes much easier than a fixed infrastructure layout that makes flexibility virtually impossible.

The lack of a permanent infrastructure means that factories can move away from fixed assembly lines, and more to a modular manufacturing scenario, which includes high-mix, low-volume (HMLV) and mass customization situations.

From an expenditure standpoint, new operating expense (OPEX) models and robotics-as-a-service options allow companies to scale up or down faster, as robots are paid for on a subscription basis, or by companies paying for production output rather than capital hardware. Companies no longer need to wait for capital project approvals in order to deploy a flexible automation system.



Reason 3: Flexible automation improves visibility and drives continuous improvement

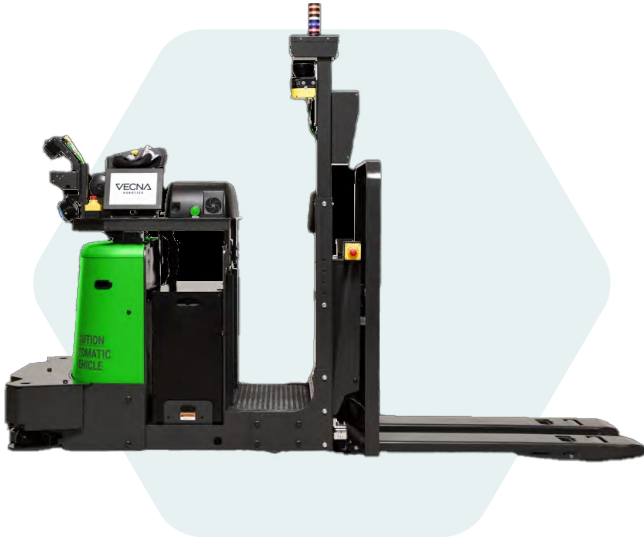
New automation systems, including robots, are designed to track parts and assemblies down to the individual component and process step level. Systems can automatically flag quality assurance issues and pull out pieces for rework or re-routing or reprioritizing tasks to optimize the process. Advanced analytics and a vast amount of data can be used to optimize the factory layout, as well as provide further operational and process insights. This drives more visibility into a manufacturing operation's output and can identify areas for improvement.

To illustrate this, think of three parallel work cells that are fed parts by autonomous mobile robots (AMRs). During the course of operation, an AMR is about to replenish the first cell, but the cell detects an issue and knows it will take longer to complete the task. It triggers the AMR to reroute, on the fly, to Cell 2, which will now be available before Cell 1. On the way to Cell 2, the AMR avoids an obstacle on its path, and logs the obstacle, which shows up on a heat map of the factory. This reveals that the path to Cell 2 overlaps with buffer storage, which frequently causes the AMRs to avoid obstacles in the area, potentially impacting delivery times. The company's operations staff uses this data to adapt the AMR paths and limit buffer storage overflow in that area for future operations.

Having data on inventory levels and other supply information is key here, as it allows the manufacturing operation to better understand what can be produced on a daily, if not hourly, basis. When a supply chain disruption event occurs (such as the lack of parts), an organization can quickly refocus their efforts on producing parts with supplies that they do have, to reduce the amount of downtime that could occur for companies waiting for their next supply truck to arrive.



Reason 4: Flexible automation helps retain labor



Manufacturing work can be difficult and complex, but at other times it can be repetitive and dull (not to mention dangerous). These tasks are the ones that are being enabled by flexible automation systems, such as AMRs delivering parts to resupply manufacturing equipment, instead of having someone pull or push a heavy cart long distances.

New studies around the effectiveness of automation in terms of keeping employees engaged and making their jobs more valuable. For example:

- A survey of executives showed that **85% said they believe automation will help them retain workers** by letting them focus on less mundane work and improving overall engagement and safety. Because of this, 70% said they plan to increase automation investments.
- **A survey by Zebra Technologies** showed 73% of executives said the optimal automated processes are a combination of human and robots, evidenced by the rapid growth of cobot purchases representing **35% of all robot sales in 2019 to 56.5% in 2021.**
- With the right applications, **human-robot teams are up to 85% more efficient** than humans or robots working alone.

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With continuous labor shortages across the supply chain, it makes more sense for companies to focus on keeping the employees they have and make them more productive through the use of flexible automation, rather than spending money on trying to find new labor.

In addition to keeping employees engaged and productive, flexible automation practices as outlined in previous sections would allow labor to be continually working on new lines and new products, instead of waiting around doing nothing, or potentially avoiding a furlough should key supplies not arrive due to disruptions.



Reason 5: Flexible automation improves quality and bottom line

According to the U.S. Bureau of Labor Statistics, in June 2022, [there were 790,000 job openings](#) in the manufacturing industry, representing 5.8% of all manufacturing jobs. On job site Indeed.com, there are currently [more than 321,000 open “manufacturing jobs” available](#). It is clear that just posting a “Help Wanted” sign in the window is not going to improve operations for many manufacturers.

Flexible automation systems can not only reduce the need for additional labor, but improves efficiency of operations by delivering more consistent task and cycle times. This allows companies to do more with less by focusing scarce labor resources on higher-value tasks (see Reason #4).

Smaller facilities can also find that they can produce more through automation. Instead of needing a mega-plant in order to create products, companies can build smaller plants closer to local markets, which require less labor than before.

The combination of the ability to quickly change lines to adapt to supply chain disruptions along with key visibility of inventory levels to keep operations running is a key advantage for a smaller facility that can produce items for local partners.

Bonus Reason and Conclusion

All of the previous reasons allow a company’s manufacturing and distribution to be closer to the end customer, which lets them be more responsive, adaptable and resilient to ever-present shocks hitting global supply chains.

While we are not suggesting that companies completely disassociate themselves from global sources of supply, we argue that automation will provide companies with the ability to have alternative strategies that get them closer to their customers and unleash new productivity and flexibility gains.

In the long term, this will give many companies a competitive advantage over companies that decide to adopt a “wait and see if this solves itself” strategy. Operations that can utilize flexible automation to react to supply chain disruptions, diversify their supplier base (who also are becoming more flexible), utilize data to keep inventory levels consistent and avoid downtime, retain their workforce to avoid labor shortages, and improve quality through consistency and accuracy will find themselves steps ahead of competitors.



If you are a material handling professional and want to explore automation solutions, reach out to us at sales@vecnarobotics.com for a free consultation. If you would like to read the other white papers in this series, go to www.vecnarobotics.com/resources for more information.