



WHITE PAPER:

AUTOMATED KITTING

For the Next-Gen Factory Floor

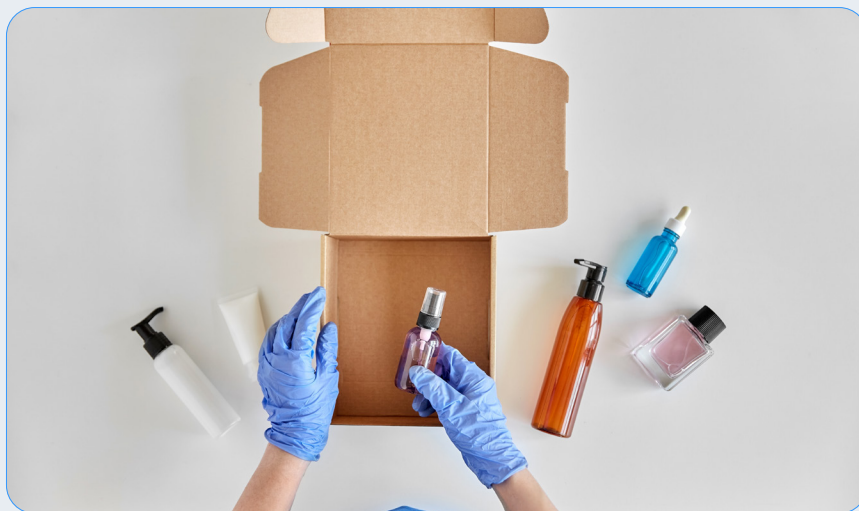




What is Kitting?

Kitting can be defined as the process of picking and delivering all the required components for the assembly of a given product or order. It plays an indispensable role across warehousing, fulfillment, and manufacturing operations, helping to streamline production – whether performed on-site or by third-party logistics partners.

In warehousing and fulfillment, kitting helps meet rising consumer expectations and manage increasing product variations by grouping items into ready-to-ship kits—reducing picking times, improving order accuracy, and enabling faster, more customized deliveries. In manufacturing, kitting addresses the growing complexity of product designs by pre-assembling components before they reach the production line, streamlining operations, minimizing assembly errors, and boosting efficiency in high-mix, low-volume environments. Despite its benefits, kitting often remains a manual process, as current technical solutions often fail to deliver a return on investment that justifies automation.



This paper explores current market trends driving the evolution of kitting, outlines the key challenges businesses face in implementing efficient kitting strategies, and presents the solutions Mantis Robotics offers to address these challenges.

From flexible automation technologies to smart integration approaches, we highlight how our systems are designed to enhance kitting performance, reduce labor dependency, and adapt to the dynamic demands of modern production and logistics.

Market Analysis

Kitting is widely used across various industries. In distribution centers, it is employed to bundle frequently purchased items into ready-to-ship kits. This approach reduces picking time, simplifies inventory management, and accelerates order fulfillment—especially for commonly paired or customized product combinations.

According to Dataintelo (2025), **the global 3PL kitting and fulfillment market is projected to reach \$1.5 billion by 2029, with a compound annual growth rate (CAGR) of 8.4% from 2023 to 2030.** This growth is primarily driven by rising consumer expectations for fast and accurate deliveries. The continued expansion of e-commerce is also fueling demand for automated warehousing solutions and more efficient fulfillment processes. This trend is expected to persist as more retailers embrace automation to improve operational efficiency, lower labor costs, and remain competitive in a rapidly evolving market.

Kitting also plays a growing role in manufacturing. As products become more complex and cost pressure increases, manufacturers are expected to deliver higher-quality assemblies at lower cost. To stay competitive, many factories are adopting kitting to pre-organize components for complex assemblies. This reduces line-side inventory and improves workflow efficiency. Digital platforms are increasingly used to coordinate in real-time between kitting stations and assembly lines, maintaining optimal production speeds. In the electronic component kitting robot market alone, the market is expected to grow from \$2.16 billion in 2024 to \$6.18 billion by 2033, with a CAGR of 12.4% (Dataintelo, 2025). Similar trends are emerging across the automotive, construction, and marine industries, as these sectors also recognize the benefits of kitting in streamlining operations and boosting productivity.

While the benefits of kitting are well established, automating the process takes those advantages to the next level. Automated kitting systems significantly outperform manual operations in both efficiency and cost-effectiveness. **Companies that have implemented automation report up to a 60% increase in daily output, while requiring 65% less manual labor.** In addition, automation can lead to an 85% reduction in cost per order (Opex, 2025), making it a compelling investment for businesses seeking to scale operations, improve accuracy, and reduce dependence on manual workflows. As labor shortages persist and the demand for speed and precision continues to grow, automated kitting is quickly becoming the new standard for both the logistics and the manufacturing environment.



Manual Kitting Challenges

Despite clear benefits, kitting remains a predominantly manual process due to three core challenges:

1. Product and Part Variability

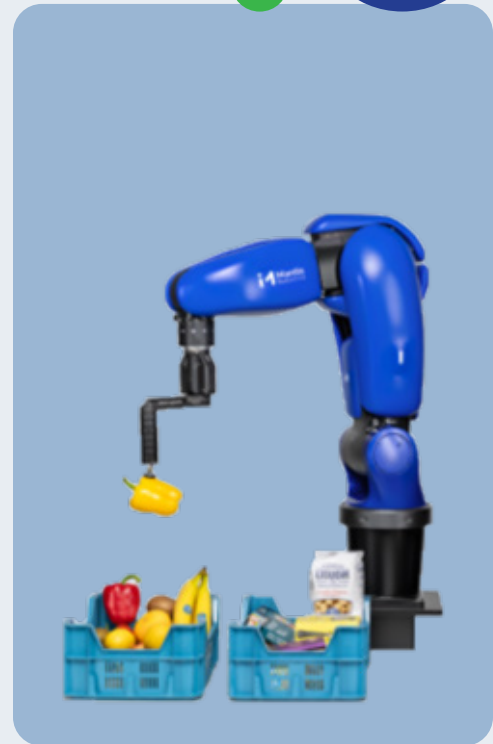
Kitting often involves a wide range of items—varying in size, shape, weight, and packaging. These frequent changes make it difficult for traditional automation systems to keep up without extensive reprogramming or mechanical adjustments.

2. Labor Constraints

With labor shortages and rising wages, maintaining staffing levels—particularly during seasonal peaks—has become increasingly difficult. Manual processes are also prone to picking and sorting errors, leading to delays, returns, and dissatisfied customers.

3. Scaling Limitations

Manual kitting struggles to scale. Throughput is limited by available labor, and inconsistent productivity hampers efforts to meet growing order volumes or tight delivery deadlines.





Next-Generation Kitting Automation

To address these challenges, automation must evolve. While the potential benefits of automation—higher accuracy, consistency, and scalability—are clear, traditional solutions often fall short in dynamic kitting environments. Therefore a new generation of systems is needed, designed to meet three critical requirements at the same time:

1. High Throughput

Kitting applications across manufacturing, e-commerce, and food industries require fast, reliable performance to meet tight deadlines and handle fluctuating volumes. While traditional industrial robots offer the necessary speed, they typically rely on safety fencing which limits flexibility, utilizes valuable floorspace and increases deployment complexity. Conversely, collaborative robots (cobots) are designed for safe human interaction, but often lack the cycle time required for high-throughput operations. What's needed is a solution that delivers industrial-level speed while remaining safe and deployable in open, shared spaces.

2. Quick & Easy Changeovers

Modern kitting tasks demand systems that can adapt to:

- Frequent product and part changes
- Irregularly shaped or fragile items
- Quick setup times and minimal downtime

Legacy automation struggles here, as reprogramming and retooling are time-consuming and costly. Instead, next-generation systems enable quick reconfiguration—ideally using intuitive software and vision systems—so operators can adapt the workflow on the fly without deep technical expertise.

3. Maximizing Floorspace

Space is often at a premium in fulfillment centers and assembly lines. Traditional robots require substantial space for cages, conveyors, and buffers—sometimes doubling or tripling their footprint. In contrast, compact, modular automation should be designed to fit into existing workflows without extensive layout changes or infrastructure investment.

Automation shouldn't demand a complete factory floor redesign—a costly and logistically complex undertaking. Instead, it should integrate seamlessly into existing workstations without the need for isolated robot cells. The ideal solution offers plug-and-play adaptability, minimizing layout changes and avoiding major infrastructure investments.



The Mantis Solution

Mantis has developed the MR-1, a robot specifically designed to address the unique challenges of kitting automation. It combines industrial-grade speed with the ability to work safely alongside humans, thereby eliminating the need for protective cages. This is made possible by its advanced physical AI engine and integrated 3D perception system.

With built-in safety features and a compact, cage-free design, the MR-1 can be deployed directly alongside human workers. Its small footprint and collaborative functionality make it easy to integrate in existing warehouse or production line environments without the need for layout changes or factory restructuring.

By removing the need for fencing, the MR-1 not only reduces the physical footprint but also significantly lowers upfront investment costs. Fewer safety components—such as fences and light curtains—are needed, and integration time is drastically reduced, saving both time and engineering resources.

To maximize flexibility, the MR-1 was designed with ease of use in mind. Mantis has developed a human-centric, object-oriented approach to robot programming that requires no coding. First, you set the workflow or operation sequence, thinking about the application just as a person would. Then, you build the virtual environment by dragging and dropping objects into their correct positions around the robot—just like arranging them in real life. This lets you create the virtual kit exactly as it exists physically. From here, the software takes over and generates all the necessary code.

The intuitive drag-and-drop interface allows even non-technical users to program or adjust tasks quickly. This makes it especially well-suited for dynamic, high-mix environments where parts change frequently and batch sizes are small. Whether adapting to new products or shifting workflows, the MR-1 delivers the versatility needed to keep operations moving efficiently.



75%
CHEAPER DEPLOYMENT

80%
LESS FOOTPRINT

6x
FASTER THAN COBOTS

SAFE
OUT-OF-THE-BOX

Key Takeaways



As warehousing and manufacturing environments grow more complex, **kitting has become essential for improving efficiency, accuracy, and adaptability.** However, the manual nature of traditional kitting methods limits scalability and performance. While automation holds great promise, many legacy systems fall short in high-mix, dynamic environments due to lack of speed, flexibility, or ease of integration.

The MR-1 from Mantis Robotics directly addresses these challenges. **Combining industrial-grade speed with collaborative safety, a compact footprint, and intuitive operation, it provides a future-proof solution for businesses seeking to modernize their kitting operations.**

References

Dataintelo. (2025). Electronic Component Kitting Robot Market.

Dataintelo. <https://dataintelo.com/report/electronic-component-kitting-robot-market>

Dataintelo. (2025). Pick and Pack Robot Market. Dataintelo.

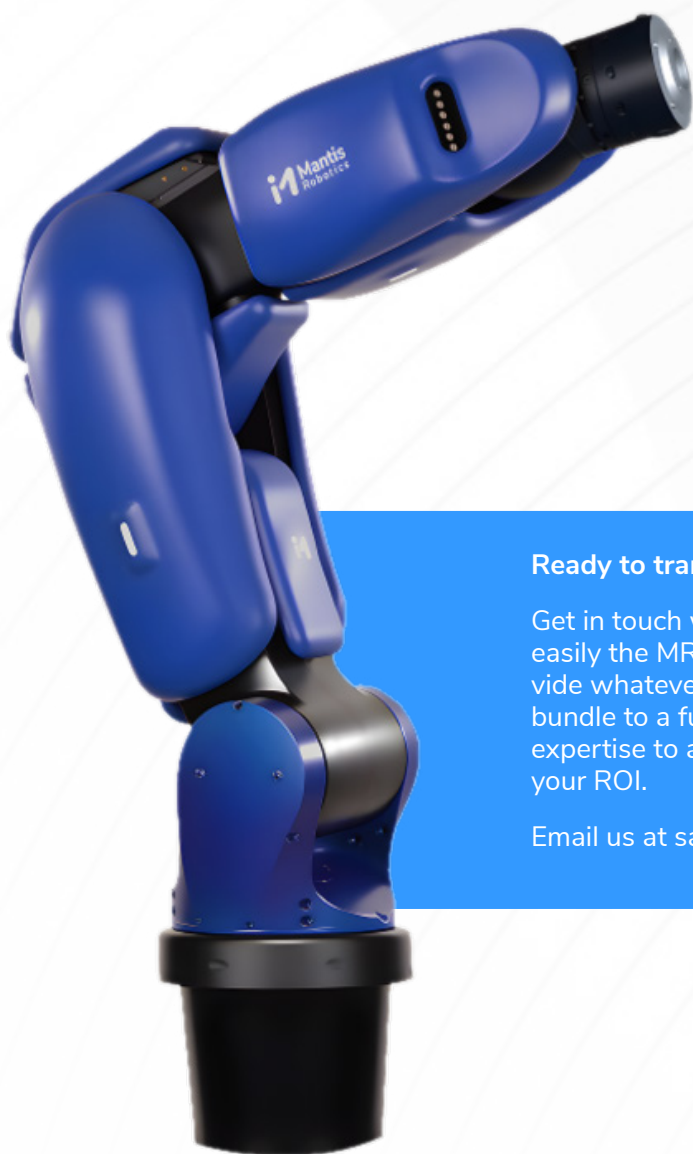
<https://dataintelo.com/report/global-pick-and-pack-robot-market>

Opex. (2025). The Future of Kitting: Driving Efficiency and

Growth with Sure Sort. Opex. <https://www.opex.com/use-cases/automating-kitting-operations/>

Whether you're looking to boost throughput, reduce labor dependency, or increase flexibility, the MR-1 is designed to meet the demands of today's logistics and production workflows.





Ready to transform your kitting operations?

Get in touch with our team to schedule a demo or learn how easily the MR-1 can fit into your workflow. Mantis can provide whatever you need, from a smart robot and software bundle to a full automation solution. Leverage our team's expertise to automate your kitting operation and maximize your ROI.

Email us at sales@mantisbots.com to get started.



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