

How to evaluate robots for floor loaded trailer unloading: a comprehensive framework for operators

WHITEPAPER

Overview

This document is intended to support you as you decide which robotic solution to select for your truck and container unloading operational needs.

The walkthrough contains:

1. A guided self-assessment of your operations
2. Evaluation criteria and considerations for robotic unloading solutions
3. Questions to ask potential robotic solution providers



Operational assessment for receiving

If you are exploring automation to unload floor loaded trailers as part of your receiving operations, deeply understanding your current receiving process is critical. Each operation has its own specific requirements.

There are many factors to dive into prior to evaluating robotic solutions on the market. Your answers to this self-assessment will give you the background needed to calculate a business case and assess the potential impact of unloading automation in your operation.

Questions to ask yourself

1. Throughput requirements

- What's your current manual receiving unloading speed?
- Do you have an operational need to make any changes to the current speed or process?
- Are there any bottlenecks downstream that may limit or encourage a faster throughput need?

2. Truck and container volume

- What is your daily arrival rate/schedule of trucks and containers?
- Are those arrivals typically spread across the day or concentrated at specific times?
- How much time do the trucks and containers typically spend at your dock door?
- Do you have SLAs tied to dock time?

3. Upstream loading conditions and trailer variability

- Are trailers consistently floor-loaded, or do you see mixed pallets and loose loads?
- Do origin facilities follow standardized loading patterns, or does trailer layout vary widely by vendor?
- How often do boxes shift significantly during transit?
- What percentage of trailers arrive with damaged, crushed, or unstable loads due to origin loading practices?
- Do you receive a predictable mix of domestic trailers vs. ocean containers?

OSHA estimates that 25% of all warehouse-related injuries occur on the receiving dock, with hundreds more near misses. [\(link\)](#)



4. Box quality

- What is the quality of the box cardboard you are handling? Are they thick and sturdy to protect the product? Or are they thin and prone to tearing or damage?
- Is your environment humid, causing cardboard boxes to soften?
- Is the tape on the boxes high quality or prone to coming apart in transit?
- Do you experience crushed or damaged boxes?

5. Safety and turnover

- Do you face high turnover in the receiving dock jobs?
- Do your workers have to work in harsh environments such as extreme heat or cold?
- What does it cost to replace each person, in time, money and lost productivity?
- Do you face high levels of workers comp payouts for injuries on the inbound dock?
- What amount of insurance are you paying?

6. Current unloading capacity

- Do you unload live loads vs drop trailers?
- Do you manage your own yard?
- How many shifts of people are you using to unload your trucks and containers?
- How well are you able to match your labor capacity with demand?

7. Physical space on the dock

- How many dock doors do you have for receiving?
- How much square feet of space do you have available on the dock?
- Do you have any fixed infrastructure limiting movement on the dock?
- Do you need to keep the receiving dock space flexible? Or can you afford to implement fixed automation?

8. Downstream box orientation requirements

- Do you have a downstream sortation system that requires barcodes to be set in a specific direction so they can be read?
- Similarly, do you have any standard operating procedures for downstream palletizers to read the barcodes in a certain way?



9. Downstream volume capacities

- What is the capacity of the downstream process?
- Will it require sortation or palletization?
- Are there any planned changes to these processes?

10. IT systems

- Do you have WIFI coverage on the receiving dock? What is the strength? Do you need a WIFI survey?
- What IT security requirements does your IT team require?
- Do you need any information from the cases during the unloading process?
- Are you planning on integrating the solution with your warehouse management system (WMS)?
- What internal or contract IT resources do you have to support implementation of a robotic solution?

11. Utilities

- What are the current power drop specs on the inbound dock?
- Where are the power drops?

12. Late fees and detention fees

- Do you tend to have a lot of expensive late and detention fees for trucks at the dock?
- Are those delays negatively impacting companies down your supply chain?

Summary

This assessment gives you a clear view of how your operation actually runs and where the main constraints may be. It also helps highlight conditions that can impact performance once automation is introduced.

With this baseline in place, you can move into evaluating robotic unloading solutions using criteria that are tied directly to your real operating environment and requirements.

Weighting considerations when selecting a robotic solution

In order to assess current robotic unloading solutions, you'll need to review their overall benefits against your operational needs. Below is a suggested set of criteria and weightings to use in your analysis:

Attribute	Weight
Cost per case	35%
Safety	20%
Box dimension coverage	20%
Ease of use and installation	15%
Flexibility and expansion potential	10%
Total	100%

Cost per case (35%)

When evaluating unloading robots, cost per case should be your north-star metric as it directly impacts the bottom line of your warehouse operations. Robotics companies will often promise a certain throughput vs price, but the actual number is dependent on many variables, including box weight, dimensions, and layout within the trailer, among other things. Ensure you are working with a strong software-first company, as AI models finetuned on box environments enable solutions to handle complex box scenarios.

Questions to ask:

- How do you calculate throughput?
- Is the throughput you highlight the top-end speed or an average speed?
- What's your pricing model? Capex, RaaS, Lease, or per container?
- Do the AI models run on the robot or in the cloud?
- Do you consider robot downtime during operations in your throughput numbers or only consider when the robot is running?
- What other factors influence your throughput calculation?
- Is your robot solution capable of picking multiple boxes at once (multi-picking)?
- What is the installation cost of the system?
- What are the on-going costs for each of the pricing models? How will service be provided?

This use of AI means less downtime, if any, for Pixmo. It also is a major advantage over other systems out there that require experiencing thousands of issues for their models to learn.

Safety (20%)

Safety is essential in any warehouse, especially when adding robotics. Protecting workers reduces the risk of injuries and unexpected downtime.

Many unloading robots use heavy industrial arms that require gating or shielding, which limits placement options. Newer collaborative arms provide similar strength with joint-level force sensing that stops movement on contact, reducing the need for fixed barriers.

If the system includes a mobile base, consider how it operates around people. Some bases are built for shared environments and use detection systems to stop before entering a space with an operator.

Questions to ask:

- How are my operators protected during unloading?
- Does the system have collaborative features for shared workspaces?
- What sensors or systems prevent accidents or damage?
- What type of robot arm does it use?
- Does the base include collision avoidance?
- Are lockout or tagout steps required?
- What ANSI/ISO safety standards does it meet?
- Can operators safely enter the area to fix issues?
- How does it determine when it is safe to move?
- Have customers reported any injuries?

Box dimension coverage (20%)

Box dimension coverage refers to what types of boxes the robot can handle. This determines the proportion of containers the system can unload, along with how effective it will be. Consider box dimensions, weight, and the layout inside the container. Providers typically publish their size and weight limits so you can compare them to your needs.

Questions to ask:

- Can it handle different box shapes, materials, and weights?
- What box dimensions and weights are supported?
- Does it slow down for heavier items?
- What layout complexity can it manage?
- Are there settings to adapt to different unloading patterns?
- Can it handle poor-quality cardboard or thin boxes?
- Can it pick boxes that shifted during transit?
- Can you show examples at this complexity level?
- How does it handle unknown box sizes?





The multi-purpose Pixmo palletizing boxes that another Pixmo inside the container unloaded onto the flex conveyor

Ease of use and installation (15%)

Installation and usability directly affect adoption. Providers should support installation and train operators. Equally important is how easily frontline staff can diagnose and resolve issues to keep the system running.

Questions to ask:

- Do you support the first installation?
- How easily does it integrate into existing infrastructure?
- Do we need to add hardware, screens, or gates?
- How well does it integrate with our software systems?
- How complex is setup?
- Do you provide full training?
- How user-friendly is the dashboard?
- How accessible is technical support?
- What are the maintenance needs?
- How fast can issues be troubleshot?
- What WiFi requirements exist?
- What happens if dock WiFi goes down?

Flexibility and expansion potential (10%)

Dock areas are tight, and any robotic solution should fit without disrupting other work. A compact footprint and minimal gating help keep the dock clear while still automating unloading.

Unpredictable truck arrivals also make flexibility valuable. The best systems can be redeployed for other warehouse tasks instead of sitting idle.

Questions to ask:

- How flexible is the system?
- Can it operate safely outside the container?
- How does it navigate the dock and warehouse?
- What is the roadmap for additional warehouse tasks?
- When will those capabilities be available?
- How easy are software updates?
- What tools or dashboards can operators use to assign tasks?



Conclusion

Evaluating robotic solutions for truck and container unloading requires careful consideration of a variety of factors. From throughput and safety to box ranges capability, versatility, handling systems, and ease of installation and use, there are many considerations to navigate. Each of these plays a crucial role in deciding on the right choice to optimize your warehouse receiving dock.

By prioritizing these considerations and selecting the best robot for the needs of your specific operations, your company can mitigate labor shortages, enhance efficiency, and ensure the smooth flow of goods through your supply chains.

For further guidance on selecting the ideal unloading robot for your warehouse, or to learn more about our Pixmo robotic solution, contact us via our website at: www.anyware-robotics.com.

About Anyware Robotics

Anyware Robotics deploys multi-purpose mobile robots, equipped with physical AI, to safely and autonomously handle strenuous and repetitive industrial tasks.

Pixmo, the company's robot, is designed to autonomously handle boxes for trailer unloading, palletizing, case picking, and trailer loading. Pixmo is powered by AnywareOS, physical AI that enables advanced perception and object handling in dynamic, unstructured environments.

Pixmo's combination of intelligent software and flexible hardware helps distribution centers and 3PLs reduce labor costs, enhance worker safety, and maintain productivity during labor shortages to deliver a clear return on investment (ROI).

Anyware Robotics is headquartered in California and partners with leading retailers and logistics providers across the United States. For more information, visit www.anyware-robotics.com.