SOLVE LOADING DOCK CHALLENGES WITH ROBOTIC UNLOADING

Breakthrough Technology Fully Automates Unloading While Matching Human Performance
Table of contents

1  Solve Loading Dock Challenges With Robotic Unloading

1  Labor Challenges Plague the DC

1  Labor by the Numbers

2  Why Not Automate? Matching Technology With Unloading

2  Current Macroeconomic Conditions

4  Putting Together Technology for Real-world Demands

6  New Possibilities for Labor and Management

6  Sample Labor Cost Savings
Solve Loading Dock Challenges With Robotic Unloading

Breakthrough Technology Fully Automates Unloading While Matching Human Performance

The receiving dock is ground zero of the supply chain labor crisis. Loading and unloading freight from trailers, trucks and shipping containers are arduous, repetitive tasks plagued by high turnover. Even with regularly available staff, manually unloading freight and the constant lifting and twisting results in fatigue and inconsistent, declining productivity.

These challenges on the loading dock are characteristic of greater pressures facing supply chains from the rise of e-commerce. Often referred to as the “Amazon Effect,” businesses must lower logistics costs while keeping up with stricter service level agreements (SLAs). This new model forces supply chains to transform, modernize processes, and enlist innovative technologies to remain competitive.

This white paper examines the specific labor, operational and technological challenges on the loading docks of distribution centers (DCs), and introduces a new solution to help deliver the performance modern supply chains require.

Labor Challenges Plague the DC

The labor challenge facing DCs is twofold, rooted in overall trends of availability and turnover, and the nature of manual unloading tasks. The U.S. Bureau of Labor Statistics reports high growth in logistics jobs during the 2010s, but finding qualified labor to fill those jobs is proving to be a persistent, growing challenge. Available job candidates often come with extra complications that can compromise hiring standards and have high wage expectations.

Labor by the Numbers

- Nearly 30 percent of the workforce is age 55 or older
- The annual turnover rate among warehouse workers is 36 percent
- The cost to rehire ranges from 25 – 150 percent of an employee’s annual salary
- 600,000 U.S. warehouse jobs were unfilled in 2017
- Repetitive motion injuries like those found in unloading tasks on the dock costs employers $80 million annually
- Industry growth outpaces the labor pool by a rate of 6:1
The arduous, repetitive nature of loading and unloading tasks in the DC exacerbates these challenges, and sows seeds for high turnover. As labor becomes increasingly scarce and the market for a limited workforce becomes more competitive, incentives and wage wars drive up costs and provide an extra challenge for sound operations. Freight containers and docks are rarely temperature controlled and typically amplify outside conditions, making the unloading task more uncomfortable – sweltering hot in the summer and bitterly cold in winter. Therefore, employees spend most of their time twisting and lifting in extreme temperatures and encounter collapsing freight. This leads to cuts, scrapes, bruises and other repetitive motion injuries – the type of injuries that result in the most prolonged work absences annually.

Why Not Automate? Matching Technology With Unloading

Finding the technology to automate unloading freight is a longstanding challenge, mainly due to the throughput requirements and variety of package characteristics, including size, weight and type of container.

But the urge to automate the process continues, as manual unloading is ultimately prone to inefficiency and inconsistency – two grave enemies for tightly managed, process-driven supply chains. These, in turn, hinder DCs from optimizing operations to meet retailers’ demands for reduced logistics costs and compliance with strict service level agreements.

It’s time for an automated solution.

A truly automated solution would handle the job independently with no strings attached. First, this means speed – the ability to meet or exceed manual performance benchmarks for throughput and package care. But it also requires flexibility, as the dock plays host to a wide range of packages and loading configurations that can often shift in transit.
The industry has seen some attempts to implement automation, such as ergonomic assistance like a conveyor extending into a trailer, and operator-piloted systems that relieve the physical burden. However, both of these approaches still require worker supervision throughout the process. This in turn fails to address the challenges operations have sourcing labor — a critical need in today’s competitive environment.

Some solutions have emerged that do not require operator involvement, such as articulated robotic arm unloaders and curtain systems. But each comes with costly tradeoffs. Articulated arm systems possess speed limitations, and are not a strong fit for all applications. Curtain systems bring a high risk of product damage and costly, difficult-to-maintain modifications to trailers that are especially challenging when trailer fleets are not under the same ownership.

<table>
<thead>
<tr>
<th>Solution</th>
<th>Functional Description</th>
<th>Drawback</th>
</tr>
</thead>
</table>
| Ergonomic Assistance           | • Extended conveyor that reduces the physical strain of operators reaching, bending and moving  
• Speeds movement of goods through the facility | • Requires manual work to lift and move items  
• Not fully automated |
| Operator-piloted Systems       | • Employee operate onboard or remotely using a ‘pilot’ system to handle unloading function  
• Eliminate manual work and physical strain of operators  
• Reduce operator injury | • Requires operator attention throughout process |
| Articulated Robotic Arm Unloaders | • Robotic arm grabs and moves freight  
• Work quickly with minimal supervision  
• Require no modifications to trailers or DC processes | • Limited throughput capability  
• Limited size and weight of items handled  
• Reduced product size and weight range due to tool limitations |
| Curtain System                 | • Freight cascades through curtain and falls to the floor  
• Handles a wide variety of product sizes and weights  
• High throughput capability | • Rough on products, increasing product damage  
• Requires costly modifications to trailers  
• Challenging to maintain optimal performance, due to improper loading or misaligned trailers  
• Lacks flexibility to service multiple dock doors  
• High risk of product damage |
Existing unloading technologies fall short, with crucial flaws that hinder widespread adoption. A truly effective automated solution provides a high level of independence and performance, delivering the throughput, package care and labor savings necessary for strong return on investment.

**Putting Together Technology for Real-world Demands**

Delivering the necessary capability comes not from a single innovation, but through combining several advances in a tightly integrated package. New robotic gripping technology can consistently handle a broad range of package sizes and types, while advanced vision and onboard intelligence enable them to be leveraged to the greatest effect – with the highest level of precision and improving each time. The robots learn from each grasp, using insights from previous attempts to inform approaches to handling new products.

This machine-learning capability enables the necessary flexibility to handle the velocity and variability of modern commerce. Instead of requiring new programming in order to handle newly introduced products and packaging types, smart robots can compare them to past experiences and continue the cycle of learning and continuous optimization.

Onboard intelligence plays a critical role in conjunction with the gripping technology to provide the necessary level of package care, while enabling the fast decision making to meet throughput targets. As different products and packaging types can withstand different levels of force, the onboard intelligence is capable of finding the just right, “Goldilocks” setting to strike the balance of a secure grip and package preservation.

Of course, solving the labor challenge does not end with the abilities to pick up and move product. Constant intervention for exception handling or requiring highly skilled technical labor to set up and activate solutions do little to relieve labor pressures. A system should be sophisticated enough to do some problem solving, while offering a level of simplicity on par with other commonly used warehouse equipment, like forklifts.

Ultimately, an automated unloading solution of such comprehensive capability dramatically changes the labor equation. If a single operator can supervise four or five fully automated unloaders, this can effectively reduce the labor burden by more than 80 percent – dropping from a crew of eight or nine employees to a single supervisor. Peak performance is the norm, sustained through the entirety of a shift and matching or exceeding manual processes.
<table>
<thead>
<tr>
<th>Solution</th>
<th>Function</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>End-of-arm tool and straddle arm robot</td>
<td>Unloads trailer back to front, picking multiple items at a time</td>
<td>Increases throughput and package-handling flexibility</td>
</tr>
<tr>
<td>Intelligent pick planning</td>
<td>Uses machine vision and advanced algorithms to guide selection</td>
<td>Preserves package integrity and becomes more effective over time</td>
</tr>
<tr>
<td>Integrated unscrambler and side guides with automated jam recovery</td>
<td>Automatically handles exceptions or errors without manual intervention</td>
<td>Limits operator interventions, even during high-volume processing</td>
</tr>
<tr>
<td>Extendable “nose” conveyor</td>
<td>Sweeps up packages that fall during transit</td>
<td>Recovers dropped packages without the need for manual intervention</td>
</tr>
<tr>
<td>Built-in connectivity</td>
<td>Provides real-time performance data to on- and off-site resources</td>
<td>Enables remote maintenance support</td>
</tr>
</tbody>
</table>
New Possibilities for Labor and Management

Robotics capable of fully automating unloading tasks bring a new paradigm to the dock. High performance and flexibility push unloading from a labor-heavy, manual chore to an automated, refined process.

This opens up new opportunities for management and employees alike. High-performing DC workers can take more desirable positions, with relief from unpleasant work conditions. Management gets to replace uncertainty and staffing challenges with a reliable, automated process, with data to fuel continuous improvement.

As the Connected DC comes into focus, solutions like the robotic unloader from Honeywell Robotics will play a critical role in spreading the promise of improved reliability, utilization and productivity to new processes. It lays the foundation for digital transformation, unleashing data to refine and adapt processes to keep up with changing demands and make the most of automation investments.

Sample Labor Cost Savings

<table>
<thead>
<tr>
<th>Cases per hour</th>
<th>Labor</th>
<th>Robot</th>
</tr>
</thead>
<tbody>
<tr>
<td>500–800</td>
<td>$45/ hr</td>
<td>$100–120/hr</td>
</tr>
<tr>
<td>2–4,000</td>
<td>2.5–4 hrs</td>
<td>1.75–2 hrs</td>
</tr>
</tbody>
</table>

Labor costs: $45 / hr  
(assuming $15 / hour X 3 employees per container)

Labor cost savings:  
$112.50 – $180 per trailer

Annual savings:  
Average of 15 trailers per day, 5 days / week:  
$438,750 - $702,000