

A better way to deliver

OPTIMIZING THE MODERN WAREHOUSE: HOW GEODIS MAXIMIZES FULFILLMENT EFFICIENCY

Strategic slotting and intelligent wave optimization are key parts of modern warehouse efficiency. Learn how our solutions deliver 15-60% performance gains.



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Introduction

There's never been a greater need for efficient warehouse operations. Brands and logistics providers must remain competitive to meet customer expectations and handle operational pressures. Customers need faster delivery, accurate order fulfillment, and greater product availability. Operational pressures require greater cost control and more efficient workforces. These competing demands require a fundamental shift in how we optimize our warehouses.

Many warehouses struggle with inefficiencies. One of the most striking is that pickers can spend up to 70% of their working time simply walking from one location to another during the picking route. Reducing this travel time is central to improving productivity for warehousing providers and brands.

Relying on conventional warehouse management approaches like basic slotting practices or traditional wave releases does limit warehouse optimization. While these strategies have served the logistics industry for decades, they often operate as disconnected, siloed systems. This results in:

- Inefficient inventory placement, leading to excessive travel time
- Suboptimal order batching, resulting in redundant picking paths
- Labor allocation that doesn't match with actual operational needs
- Underutilization of prime warehouse space with slow-moving inventory
- Inability to quickly adapt to changing order patterns and volumes

These inefficiencies extend beyond the warehouse floor. They can impact your ability to meet service level agreements, increase your operating costs, and ultimately affect customer satisfaction.

At GEODIS, we believe that warehouse optimization requires an integrated approach. We've developed a comprehensive solution that uses real-time data to optimize inventory slotting and wave picking together.

Our approach uses advanced analytics to transform how our warehouses operate:

- Strategically placing inventory based on movement patterns and operational needs
- Intelligently grouping orders to minimize travel time and maximize picking efficiency
- Identifying and relocating slow or dead inventory to optimize valuable warehouse space
- Continuously adapting to changing order patterns through predictive analytics

Our pilot implementations and data analysis show workforce efficiency improvements between 15% to 60%, with even well-organized facilities seeing significant gains. These improvements translate directly into lower labor costs, increased throughput, and meeting customer expectations.

In this white paper, we explore the challenges facing modern warehouse operations, detail our integrated approach, and share real-world optimization result—all at no additional cost to GEODIS clients.

Discover how our unified approach to warehouse efficiency can transform your logistics operations.



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Executive Summary

Warehouse efficiency directly impacts your bottom line. Optimization is essential, as pickers spend a great deal of their time simply walking between locations. GEODIS has created an integrated warehouse management solution that combines two powerful, complementary approaches:

- **Slotting optimization** places the right items in the right locations at the right time. It uses data analysis to position inventory based on movement patterns, order frequency, and operational needs.
- **Wave pick optimization** intelligently groups orders to minimize travel time and maximize picking efficiency. It optimizes pick paths to significantly reduce aisle visits.

Our pilot programs have demonstrated remarkable results:

- **15%-60%** overall efficiency improvements.
- Up to **47%** reduction in aisle visits per task.
- Up to **30%** improvement in units per hour processed.
- Up to **10%** reduction in task count.
- Up to **18%** increase in orders per task.

These improvements directly benefit your business and GEODIS through:

- **Reduced costs** by optimizing picker movement.
- **Increased throughput capacity** without additional resources.
- **Enhanced ability** to meet service-level agreements.
- **Better usage** of valuable warehouse space.
- **Improved visibility** through comprehensive performance dashboards.

If you're a GEODIS client, you can take advantage of our warehouse optimization:

- **Quick implementation** in just 2-3 weeks per component.
- **No additional cost** for GEODIS clients.
- **Minimal disruption** to ongoing operations.

Current availability and future plans:

- Available now through manual implementation.
- Will become a standard feature for GEODIS U.S. clients.

Talk to your GEODIS U.S. account manager about warehouse optimization. If you're not already a GEODIS client, get in touch via our website at [geodis.com/us-en](https://www.geodis.com/us-en)



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Understanding Modern Warehouse Challenges

Today's warehouse operations face mounting pressures from multiple directions. Understanding these challenges is essential to optimizing warehouses.

The labor efficiency challenge for pickers

Labor efficiency starts with making the best use of a picker's energy—reducing the 60-70% of the time they spend walking from one location to another. This travel time results in lost productivity and substantial labor costs.

Labor management is even more of a challenge when dealing with fluctuating demand. Warehouses need enough staff to handle peak periods without maintaining excessive labor during slower times. This balancing act becomes increasingly difficult as:

- Customer expectations for same-day and next-day fulfillment continue to rise.
- Order patterns become more volatile and less predictable.
- Competition for warehouse labor intensifies.
- Training and retaining skilled workers grows more challenging.

The inefficiencies of traditional picking methods can make things even more difficult.

The labor efficiency challenge for pickers

Warehouses typically use one or more common picking strategies, but each has limitations.

S-shape picking strategy

This approach requires pickers to walk up and down entire aisles that contain picks, following an S-shaped path through the warehouse. While this is a straightforward way to pick goods, it often results in unnecessary travel when picks are concentrated in specific areas of an aisle.

Return picking strategy

With this method, pickers enter and exit each aisle from the same end, only visiting aisles that contain picks. This is effective when most pick locations are concentrated at one end of each aisle or when using flexible storage with high-velocity items at the front. Unfortunately, it does create inefficient back-and-forth movement when picks are distributed throughout the warehouse.

Mid-point strategy

This approach divides the warehouse into two halves. Picks closer to the bottom half of the aisle are retrieved from the bottom cross aisle. Picks from the top half are retrieved from the top cross aisle. This strategy can outperform S-shape picking when the pick density is low, but it's inefficient for higher pick densities.

Pickers avoid the largest gap between pick locations in an aisle. While this reduces unnecessary travel within aisles, it requires more complex routing logic and can confuse pickers.



- Prime picking locations are often occupied by slow-moving inventory.
- High-velocity items may be scattered throughout the facility rather than positioned for efficient access.
- Dead stock and slow moving inventory takes up valuable real estate.
- New product introductions require continual repositioning of storage.
- Seasonal fluctuations create temporary space pressures.

Impact on business performance

- **Fulfillment speed:** Inefficient picking routes and poor inventory placement extend order processing times, potentially causing missed delivery promises and reducing customer satisfaction.

- **Operating costs:** Excessive travel time translates directly to higher labor costs. When pickers spend most of their time walking rather than picking, costs per order can increase.
- **Service level compliance:** Suboptimal warehouse operations make it difficult to consistently meet service level agreements, especially during peak periods or when dealing with unexpected surges in demand.
- **Scalability limitations:** Scaling warehouse operations to handle growth requires significant increases in labor and space.

The warehouse optimization opportunity

These challenges provide significant improvement opportunities for improvement. Warehouse optimization can:

- Dramatically reduce picker travel time.
- Improve labor utilization and productivity.
- Optimize space allocation for inventory.
- Enhance order fulfillment speed and accuracy.
- Increase warehouse throughput without expanding physical infrastructure.

Making these changes means a change in approach and moving beyond siloed optimization efforts. As we'll explore in the next section, true transformation comes from an integrated approach that optimizes both where inventory is placed and how orders are processed.



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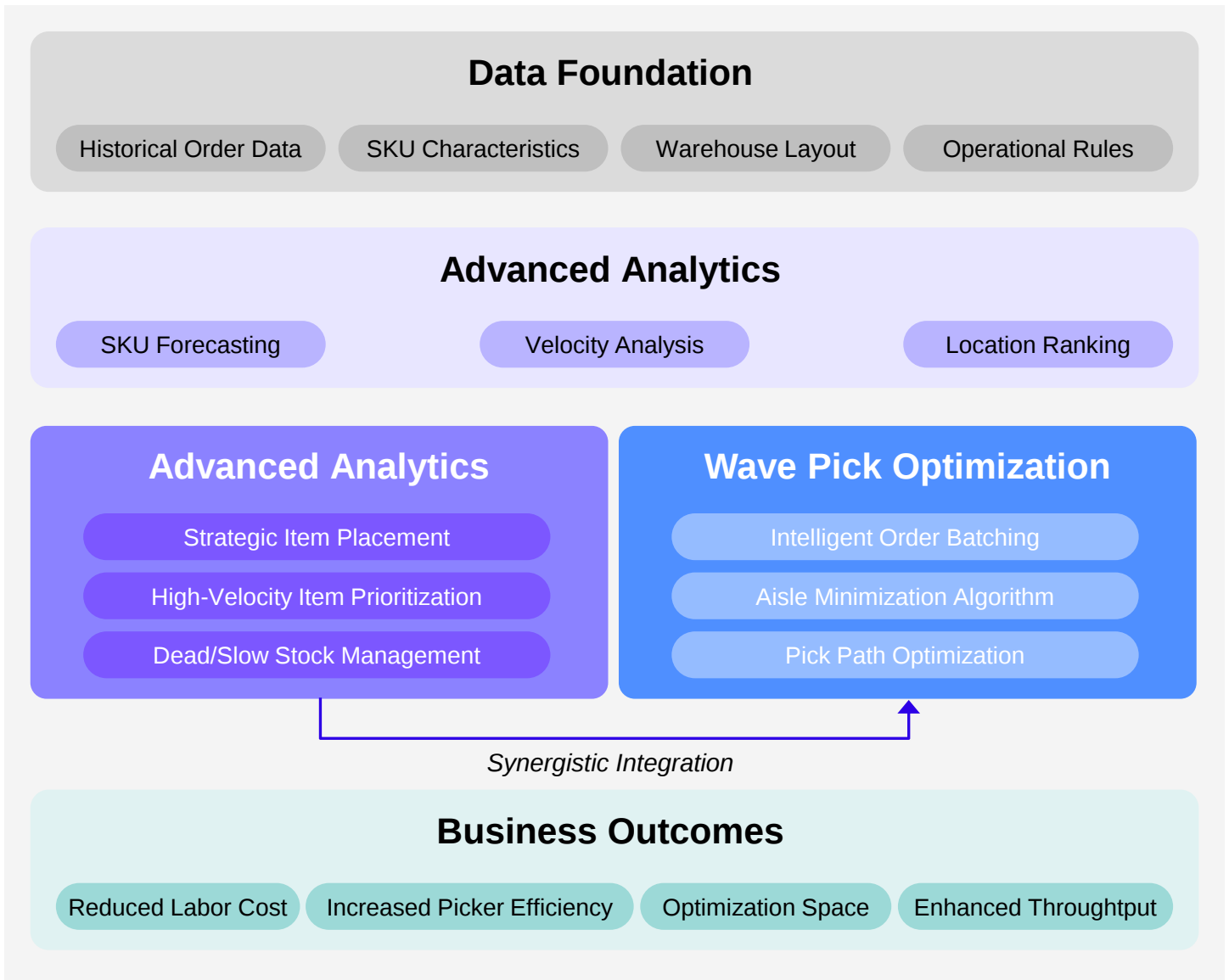


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GEODIS Integrated Warehouse Optimization Framework



Data-driven decision making

Our system uses machine learning and data analysis to make smart decisions:

- Analyzes 52 weeks of rolling historical order data, refreshed every week.
- Develops individual machine-learning models for each SKU using the open-source Facebook Prophet time series model.



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- Identifies dead inventory (no orders in 6+ months) and slow movers (present 3+ months with weekly mean ≤ 10 units).
- Ranks items based on movement velocity and operational importance.
- Ranks locations based on accessibility and proximity to outbound areas.
- Creates optimized picking groups that minimize travel distance.

This approach allows us to make real-time decisions about inventory placement and order processing based on actual usage patterns rather than assumptions or outdated rules.

Key warehouse optimization areas

Our approach creates improvements across several critical areas

Inventory placement and management

- Warehouses have inventory with vastly different movement patterns. Our slotting optimization identifies these patterns and strategically positions inventory to:
- Place high-velocity items in prime picking locations near outbound areas.
- Group complementary items that are frequently ordered together.
- Relocate slow and dead movers from valuable pick-front real estate.
- Adapt to seasonal changes and new product introductions.

Order processing and fulfillment

Grouping the right orders for picking dramatically impacts travel time and overall efficiency. Our wave pick optimization creates intelligent batches that:

- Minimize aisle visits for each picking route.
- Maximize the items picked per location visited.
- Balance workload across available pickers.
- Adapt to changing order patterns throughout the day.

Labor utilization

By reducing the time pickers spend walking, our solution directly improves labor efficiency:

- Reduces unproductive travel time between pick locations.
- Increases the units per hour that we can process.
- Decreases task count while increasing items per task.
- Enables more predictable workforce planning.

Space optimization

Warehouse space is a valuable and limited resource. Our approach helps to optimize how we use warehouse space:

- Identifies and relocates dead/slow inventory occupying prime space.
- Optimizes location assignments based on item characteristics.
- Supports multiple storage types and picking zones.
- Reduces congestion in high-traffic areas.

Technology foundation

Our warehouse optimization combines advanced analytics with client needs and our deep operational knowledge:

- **SKU forecasting models:** Individual machine learning models for each SKU to predict future demand patterns and optimize inventory placement.
- **Location ranking methodologies:** Sophisticated algorithms rank warehouse locations based on accessibility, proximity to outbound areas, and operational factors.
- **Wave optimization algorithms:** Advanced mathematical models group orders to minimize total travel distance while meeting operational constraints.
- **Performance dashboard:** A comprehensive PowerBI dashboard provides deep insight into SKU-level data, weekly predictions, and optimization results.

Our technologies work flawlessly within our existing warehouses. Only minimal physical infrastructure changes are needed to deliver substantial efficiency improvements.

Continuous improvement

GEODIS builds continuous improvement into everything we do. Slotting and wave optimization are no exception:

1. **Analyze:** The system continually analyzes order patterns and inventory movement.
2. **Optimize:** Inventory is strategically positioned based on movement patterns.
3. **Group:** Orders are intelligently batched to minimize travel time.
4. **Measure:** Performance is tracked and used to further refine the system.
5. **Adapt:** The system evolves as order patterns and inventory profiles change.

Warehouse optimization results

This integrated approach has delivered remarkable results. We've seen efficiency improvements ranging from 15%-60% depending on current warehouse organization.



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Even well-organized facilities see 15-20% gains, while less optimized operations experience even more significant improvements.

In the next section, we'll explore each part of our solution in greater detail. You'll discover the methodologies and technologies that make these improvements possible.

Exploring slotting and waving optimization

This integrated approach has delivered remarkable results. We've seen efficiency improvements ranging from 15%-60% depending on current warehouse organization. Even well-organized facilities see 15-20% gains, while less optimized operations experience even more significant improvements.

In the next section, we'll explore each part of our solution in greater detail. You'll discover the methodologies and technologies that make these improvements possible.

Exploring slotting and waving optimization

This section explores the methodologies, technical approaches, and practical applications we use to optimize our warehouse operations.

Slotting optimization: The right item in the right location

At its core, slotting optimization addresses a fundamental warehouse challenge: placing the right item in the right location at the right time.

Smart location assignment

Our slotting optimization system uses a data-driven approach to inventory placement:

1. **Data analysis:** The system analyzes 52 weeks of rolling historical order data, refreshed weekly, to identify item movement patterns.
2. **Item ranking:** Items are ranked based on velocity, volume, and other metrics tailored to each client's operational priorities.
3. **Location ranking:** Warehouse locations are ranked using picking zones and picking sequences, with high-rank items placed near outbound areas to minimize travel time.
4. **Location assignment:** The system matches items to locations based on their respective rankings, following the shortest distance algorithm.

This approach ensures that your most frequently picked items are placed in the most accessible locations.

SKU velocity analysis and segmentation

Not all products in the warehouse move at the same rate. Our system uses advanced analytics to understand these differences and optimize accordingly:

- **Individual forecasting models:** We've developed machine learning models for each SKU using the open-source Facebook Prophet time series model, tuned for each demand profile.

- **ABC volume classification:** Items are classified by their contribution to total volume, so we can prioritize high-impact inventory.
- **Segmentation by demand patterns:** Products are segmented based on their demand variability, so we can target our optimizations to where they will have the most impact.

This granular approach to inventory analysis ensures that our warehouse layouts reflect actual usage patterns rather than assumptions or conventions.

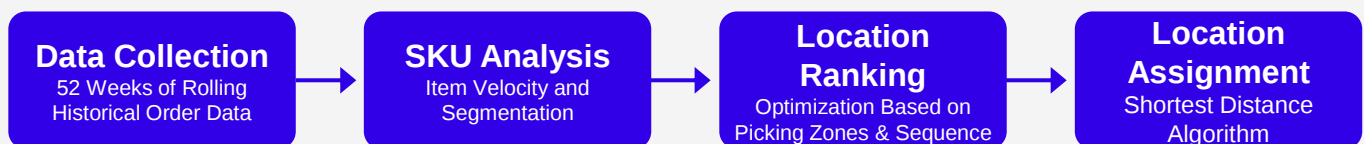
Dead and slow stock management

One of the most powerful aspects of slotting optimization is moving inventory that occupies valuable warehouse space without delivering value:

- **Dead stock identification:** Items with no orders in the past 6+ months are flagged as dead stock for potential relocation.
- **Slow mover designation:** Products that have been in a warehouse for more than three months with a weekly average pick of 10 units or fewer are classed as slow movers.
- **Strategic relocation:** Dead and slow-moving stock is moved from prime picking locations to designated areas, freeing up valuable real estate for high-velocity products.

Our pilot implementations have shown that stock management alone can significantly improve efficiency. In one implementation, relocating dead and slow movers from prime pick fronts contributed to a 30% increase in units picked per hour.

Slotting Optimization Process Flow



Inventory Segmentation Criteria

Dead Stock

No Orders in Past 6+ Months

Slow Movers

Present 3+ Months with Weekly Mean ≤ 10 Units

Implementation Benefits

- High-Velocity items near outbound areas
- Optimized space utilization
- Reduced travel time for pickers



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Wave pick optimization: Minimizing picker travel time

While slotting optimization focuses on where items are placed, wave pick optimization addresses how orders are grouped and picked.

Intelligent order batching

Our wave pick optimization system groups orders together. This minimizes the total distance traveled by pickers:

1. **Order analysis:** The system analyzes incoming orders and their line items.
2. **Pick type determination:** Orders are assigned pick types (batch, order, line) based on item characteristics and warehouse zones.
3. **Grouping and sequencing:** Orders are grouped based on parameters like carrier, delivery service, and ship date, then sequenced by priority.
4. **Batch optimization:** Algorithms create optimal batches considering cart capacity, picker availability, and aisle minimization.

This approach significantly reduces redundant travel. Our pilot implementation showed that aisle visits per task decreased by 47%.

Wave optimization process flow

Our wave optimization follows a structured, data-driven process that transforms individual orders into optimized picking groups:

1. **Order data collection:** The system begins by gathering all available orders within the specified timeframe, typically aligned with warehouse cut-off times and shipping schedules.
2. **Pick type classification:** Each order is assigned a specific pick type (batch, batch singles, order, or line) based on the characteristics of its items and the zones where they're located. This classification ensures that orders are processed using the most appropriate picking methodology.
3. **Parameter-based grouping:** Orders are then grouped based on multiple operational parameters that can include:
 - Carrier service requirements
 - Delivery time commitments
 - Requested ship dates
 - Order priority levels
 - Shipping terminals
 - Special handling requirements (e.g., hazardous materials)

1. **Sequencing by priority:** These groups are sequenced based on operational priorities such as cut-off times, service level agreements, and order urgency to ensure that time-sensitive shipments are processed first.
2. **Optimal batch formation:** The system applies our aisle minimization algorithm to create batches that minimize travel distance while respecting constraints like cart capacity and picker availability.
3. **Wave release and execution:** Once optimized, waves are released to the warehouse floor as pick tasks, which pickers or automated systems can execute efficiently.

This structured approach ensures that every wave maximizes picker productivity by minimizing unnecessary travel while still meeting all service level requirements. The process can be repeated multiple times throughout the day, adapting to changing order patterns and operational conditions in real-time.

Our pilot implementations have shown that this wave optimization process reduces aisle visits by 47% on average, with some facilities experiencing reductions of more than 80% in specific scenarios.

Aisle minimization algorithm

At the heart of wave optimization is our aisle minimization algorithm:

- Clustering analysis: The system identifies orders that can be picked together with minimal aisle visits.
- Order correlation: Orders with complementary pick locations are grouped together.
- Path optimization: Pick paths are designed to minimize aisle traversal while simplifying operations.

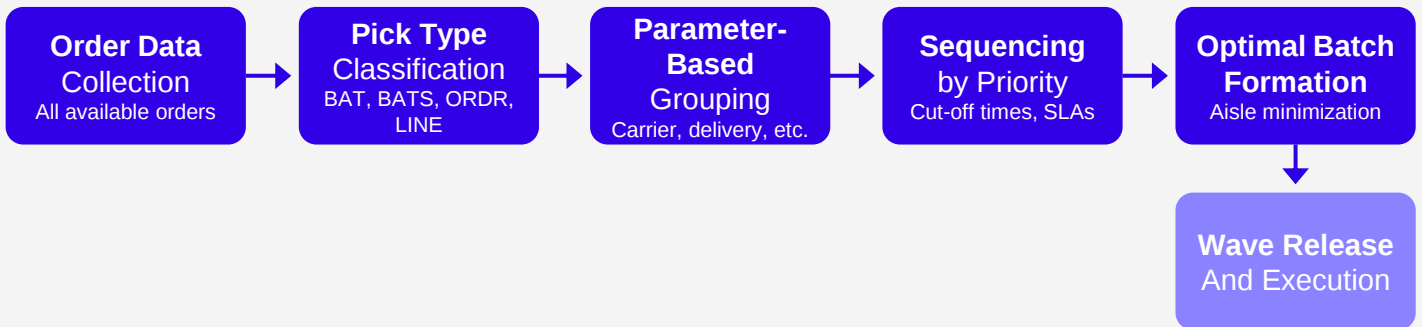
In our client implementations, this algorithm has reduced aisle visits by between 15% and 60%. Well-organized facilities saw 15-20% improvements with less optimized operations experiencing even more dramatic gains.

Congestion management for modern picking

Wave optimization extends beyond traditional picking to address unique challenges in automated environments:

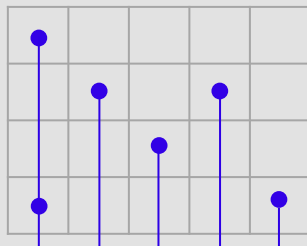
- Locus robot optimization: For facilities like ours that use Locus robots (automated warehouse picking robots), the system distributes high-velocity items across aisles to prevent congestion.
- Wave template diversification: Multiple wave templates create varied paths for pickers or robots, reducing bottlenecks in high-traffic areas.
- Strategic high-mover placement: High movers are distributed across multiple aisles rather than concentrated in a single area.

Wave Pick Optimization Algorithm



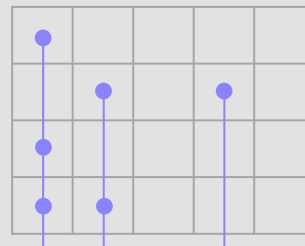
Aisle Minimization Algorithm

Aisle 1 Aisle 2 Aisle 3 Aisle 4 Aisle 5



Current: Visiting 5 Aisles

Aisle 1 Aisle 2 Aisle 3 Aisle 4 Aisle 5



Optimized: Visiting 5 Aisles

One client using this approach for a new product launch saw a 50% reduction in congestion compared to the previous year's launch. This significantly improved picking rates, even when using automated systems.

As we've seen, our integrated approach combines sophisticated slotting optimization with intelligent wave pick optimization to transform warehouse operations. In the next section, we'll examine real-world results from our pilot implementations to demonstrate the tangible benefits of our solutions.



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Pilot Warehouse Optimization Results

Our warehouse optimization approach isn't theoretical—it's delivering measurable results for GEODIS clients today. This section showcases our real-world implementations and the significant improvements they've achieved.

Warehouse Optimization Performance Results

Average Performance Improvements

53%

Distance Reduction

43%

Aisle Visit Reduction

30%

Unit Per Hour Increase

18%

Orders/Task

Client Case Study Results

Retail Distribution

- Distance: 65-70% reduction
- Aisle visits: 60% reduction
- Preprocessing capacity: Increased

eCommerce Automation

- Robot congestion: 50% reduction
- Units Per Hour: 30% increase
- Robot traffic: Better balanced

Multi-Channel Retail

- Batch count: 26.6% reduction
- Aisle visits: 81.8% reduction
- Units Per Hour: 30% Increase

Implementation Highlights

- Quick deployment: 2-3 weeks per component
- No additional cost to GEODIS clients

Efficiency Gains

- 15-60% overall efficiency improvement range
- Well-organized facilities: 15-20% gains

Rapid deployment, immediate results

One of the key advantages of our warehouse optimization solution is how quickly we can implement it:

- **Efficient implementation:** Each component (slotting and wave optimization) takes just 2-3 weeks to implement.
- **No additional cost** for GEODIS clients.
- **Minimal disruption** to ongoing operations.

This quick implementation timeline means clients can realize benefits almost immediately after deciding to optimize their operations.

Performance metrics across implementations

Our implementations show significant improvements across key warehouse metrics.

Metric	Typical improvement	Best case results
Picker travel distance	15-60% reduction	Up to 70% reduction
Aisle visits per task	47% reduction	Up to 83% reduction
Units processed per hour	30% increase	-
Task count	10% reduction	-
Orders processed per task	18% increase	-

While results vary based on initial warehouse organization and operational characteristics, all of our pilot clients saw efficiency gains that directly benefited their bottom line.

Case study: Retail distribution center

A retail distribution center implemented our wave pick optimization to improve efficiency for their manual picking operations:

Challenge:

- Excessive picker travel time.
- Inefficient order batching.
- Multiple pickers handling 500+ orders per wave.

Solution:

- Implemented wave optimization to intelligently batch orders.
- Created optimized pick paths to minimize aisle visits.
- Balanced workload across available pickers.

Results:

- **65-70%** reduction in distance traveled.
- Aisle visits decreased from 139 to 56 (60% reduction).
- Processing capacity increased significantly.

The implementation transformed how orders were grouped and processed, enabling pickers to fulfill more orders in less time with reduced physical effort.

Case study: eCommerce with automated picking

A high-tech distribution facility using Locus robots faced significant congestion during peak periods:

Challenge:

- Robots clustering around high-velocity items.
- Single pick front locations creating bottlenecks.
- Valuable warehouse space occupied by slow-moving inventory.

Solution:

- Identified 26 high-velocity SKUs contributing to 50% of total volume.
- Distributed these items across four locations in different aisles.
- Relocated dead/slow movers to designated areas.
- Created multiple wave templates for varied robot paths.

Results:

- **50%** reduction in congestion compared to the previous peak season.
- More balanced robot traffic throughout the facility.
- **30%** improvement in Units Per Hour.

This case demonstrates how our approach can be adapted to different picking methodologies, including automated systems.

Case study: Multi-channel retail distribution

A multi-channel retailer used our optimizations to improve operational efficiency during peak seasons:

Challenge:

- 253 orders requiring 350 picking batches
- 6,805 total aisle visits required
- High concentration of slow-moving inventory in prime picking locations

Solution:

- Implemented wave optimization to create efficient batches
- Identified and relocated dead/slow moving inventory

- Applied data-driven slotting recommendations for high-velocity items

Results:

- Batches reduced from 350 to 257 (26.6% reduction)
- Aisle visits reduced from 6,805 to 1,240 (81.8% reduction)
- 30% improvement in Units Per Hour

This dramatic reduction in aisle visits translated directly to labor savings and increased throughput capacity, enabling the client to handle peak volumes more efficiently without adding resources.

Implementation success factors

We're able to drive results due to several key factors:

- **Data-driven approach:** Decisions based on actual usage patterns rather than assumptions.
- **Customized configuration:** Solutions tailored to each client's specific operational needs.
- **Minimal disruption:** Implementation designed to work alongside existing operations.
- **Continuous refinement:** Ongoing analysis and adjustment to maintain optimal performance.

These real-world results demonstrate the improvements our integrated approach has on warehouse operations. In the next section, we'll explore the specific business benefits these operational improvements deliver for GEODIS, our clients, and their customers.



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Pilot Warehouse Optimization Results

Operational benefits

The most immediate benefits come from improving day-to-day warehouse operations.

Enhanced picking efficiency

Our approach resolves the fundamental inefficiency of warehouse picking—the excessive time spent walking between locations:

- Reduced aisle visits mean pickers spend more time picking and less time walking.
- More efficient pick paths minimize unnecessary movement throughout the facility.
- Balanced workload distribution improves overall picker productivity.

Optimized space usage

Warehouse space is a valuable resource, and our solution helps you maximize its value:

- High-velocity items positioned in prime picking locations.
- Dead and slow-moving inventory relocated to less premium areas.
- More strategic use of valuable pick-front real estate.

This ensures the most accessible warehouse space is used for the products that contribute the most to your order fulfillment operations.

Reduced congestion and improved flow

Beyond individual picker efficiency, our solution enhances overall warehouse flow:

- Strategic distribution of high-demand products prevents bottlenecks.
- Pick locations in automated environments reduce robot congestion.
- More balanced traffic patterns throughout the facility.
- Reduced congestion during peak periods and product launches.



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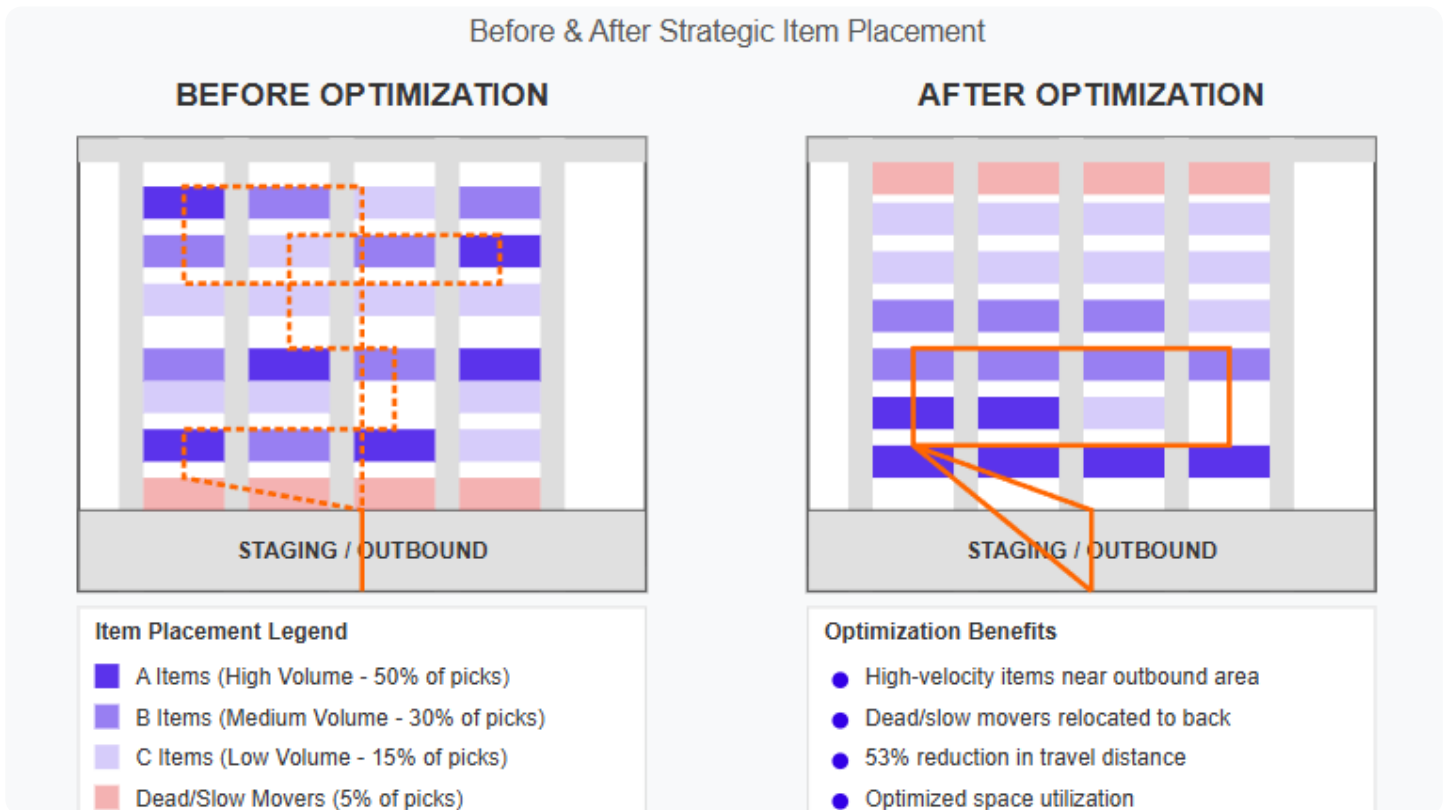


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Warehouse Floor Plan Optimization



Workforce benefits

Our solution also delivers significant benefits for our warehouse teams:

Improved productivity and job satisfaction

More efficient picking creates a better working environment for our team:

- Reduced walking distance reduces fatigue.
- More efficient workflows create a more satisfying work experience.
- Greater productivity leads to improved performance metrics.
- Less frustration from inefficient processes and congestion.

These benefits contribute to a more engaged workforce and potential improvements in staff retention—crucial advantages in today's competitive labor market.

Optimized labor allocation

Our solution helps us make the most of our labor resources:



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- More orders processed per hour with the same workforce.
- Labor resources redirected from non-value-added travel to productive activities.
- More predictable workflows improve workforce planning.
- Enhanced ability to handle volume spikes without adding temporary labor.

Business impact

These operational and workforce benefits translate directly to your business performance:

Reduced fulfillment costs

These efficiency gains deliver substantial productivity savings:

- Greater throughput without proportional cost increases.
- Reduced need for overtime during peak periods.
- More efficient use of warehouse space.

Enhanced capacity and throughput

Our solution expands order fulfillment capacities without physical expansion:

- Process more orders through the same facility.
- Handle volume spikes more effectively.
- Support business growth without proportional increases in labor and space.
- Extend the useful capacity of current warehouse infrastructure.

This enhanced capacity provides you with greater operational flexibility and resilience, particularly during peak periods or unexpected demand surges.

Improved service level performance

Ultimately, these improvements enhance your ability to meet customer expectations:

- Faster order processing supports shorter delivery timeframes.
- More accurate inventory management reduces out-of-stock situations.
- Increased capacity enables consistent service level performance even during peaks.
- Greater flexibility to adapt to changing order patterns.

By strengthening your fulfillment capabilities, our solution helps you deliver the speed, accuracy, and reliability that today's customers demand.

Competitive advantage



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In an increasingly competitive logistics landscape, warehouse optimization makes a big difference:

- Enhanced ability to meet demanding service level agreements.
- More consistent performance during challenging periods.
- Lower operating costs allow for more competitive pricing.
- Greater scalability to support business growth.

The business benefits of our warehouse optimizations extend far beyond operational metrics. By transforming the fundamental efficiency of our warehouse operations, we help you reduce costs, increase capacity, improve service levels, and build competitive advantage—all without additional cost to GEODIS clients.

In the next section, we'll explore how we implement our solutions in your warehouse operations.



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Enhancing your warehousing operations with GEODIS

We've designed a streamlined implementation process to optimize your warehousing in just 2-3 weeks per component.

Implementation process overview

We use a collaborative approach that combines your data and requirements with our optimization expertise. We will:

1. Data collection and analysis

- Gather historical order data from you (ideally 52 weeks).
- Analyze facility layout, storage locations, and picking zones.
- Document current picking paths and methodologies.
- Evaluate SKU characteristics and movement patterns.

2. Solution configuration

- Optimize our algorithms to your operations.
- Rank locations based on your warehouse layout.
- Segment SKUs based on your inventory profile.
- Develop wave templates based on your requirements.

3. Execution and implementation

- Get the open order list from your teams.
- Run our algorithms to create optimized batches.
- Send the results back to operations for implementation.
- Make recommendations in inventory placement and slotting.

4. Performance validation

- Track key metrics like aisle visits, units per hour, and travel distance.
- Compare performance with pre-implementation baselines.

- Refine our algorithms based on real-world results.
- Identify and implement continuous improvement.

Meeting specific client and facility requirements

We configure all slotting and waving requirements to facility and client needs:

- **Customizable business rules:** We define specific rules for wave planning, including criteria for grouping orders by carrier, delivery service, requested ship date, or other business-critical factors.
- **Adjustable batch sizes:** Batch size parameters are tailored to match picking cart capacity, picker capabilities, and order characteristics for each operation.
- **Flexible volume thresholds:** For facilities requiring cartonization, volume thresholds are adjusted to align with specific packaging requirements.
- **Pick zone prioritization:** We define custom rules for prioritizing picking zones based on warehouse layout and operational priorities.
- **Wave release scheduling:** Wave release timing is configured to align with specific cut-off times, shipping schedules, and labor availability at each facility.

Warehouse optimization timeline and requirements

We have a fast implementation timeline:

- **Wave optimization:** Typically implemented in 2-3 weeks.
- **Slotting optimization:** Typically implemented in 2-3 weeks.
- **Full integration:** Both components can be introduced simultaneously or sequentially, depending on your priorities.
- There is **no additional cost** for GEODIS clients

Implementation requirements are minimal and use your data and our existing systems:

- Historical order data (ideally 52 weeks).
- Warehouse layout information.
- Current location assignments.
- SKU master data.

For new clients without historical data, we can work with information from your previous providers.

Ongoing optimization and support

We'll continue to optimize your warehouse operations after initial implementation:



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- Weekly data refresh: The system analyzes the most recent 52 weeks of data each week.
- Regular performance reviews: We track key metrics and identify opportunities for further improvement.
- Continuous algorithm refinement: Our optimization approaches improve based on changing patterns and needs.
- Operational support: Our teams will assist with questions and adjustments.

This ongoing support ensures that our warehouse optimizations continue to deliver value as your business evolves.

Adaptable to diverse warehouse environments

Our warehouse optimization solution is designed to accommodate the unique characteristics of various facilities:

- **Layout flexibility:** Whether the warehouse uses traditional racking, automated storage and retrieval systems, or a combination of storage types, our solution adapts to each specific layout. The system uses existing picking sequences and zone designations as the foundation for optimization, requiring no physical reconfiguration of the warehouse.
- **Diverse picking methodologies:** The solution supports multiple picking strategies including S-shape, return method, mid-point, and largest gap approaches. We analyze current picking methodologies and optimize within that framework, enhancing efficiency without disrupting established workflows.
- **Varying facility sizes:** Our approach scales effectively from smaller distribution centers to massive fulfillment operations. The algorithms adjust automatically to different facility dimensions and configurations.

This adaptability means we can implement our warehouse optimization solution across our network of facilities, achieving significant efficiency gains without disrupting established operations.

Getting started with warehouse optimization

If you want to take advantage of our warehouse optimizations, please get in touch with your GEODIS account manager. Our team will guide you through each step of the implementation process, ensuring a smooth transition and maximum benefit for your business.



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For more information or questions about this offering, please reach out to your sales representative.



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Conclusion

The warehouse fulfillment landscape continues to evolve at a rapid pace. Customer expectations for faster delivery, perfect order accuracy, and product availability drive the need for more efficient warehouse operations. The traditional approaches to warehouse management—siloed optimization efforts, basic slotting practices, and conventional wave release strategies—no longer deliver the efficiency needed to remain competitive in today's market.

Our integrated warehouse optimization solution is a significant advancement in addressing these challenges. By combining data-driven slotting optimization with intelligent wave picking, we've created a unified approach that recognizes the fundamental interconnection between where you place your inventory and how you process your orders.

The core insight driving our solution is striking: pickers typically spend 60-70% of their working time simply walking from one location to another. By directly targeting this inefficiency through strategic inventory placement and intelligent order batching, our solution delivers transformative results—ranging from 15% improvement in well-organized facilities to 60% or more in less optimized operations.

To take advantage of our warehouse optimization, speak to your GEODIS account manager. If you're not yet a GEODIS client, discover what we can do for you at [geodis.com/us-en](https://www.geodis.com/us-en).



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Technical appendix: GEODIS warehouse optimization methodology

Data-driven analytical foundation

Our warehouse optimizations rely on sophisticated data analytics and modeling.

SKU forecasting methodology

The foundation of our slotting optimization is accurate SKU-level demand forecasting:

- **Individual SKU models:** We develop dedicated machine learning models for each SKU using the open-source Facebook Prophet time series framework, which effectively handles seasonal patterns and trend changes.
- **Adaptive tuning:** Models are tuned based on demand variability segmentation, allowing for customized forecasting approaches based on each SKU's unique characteristics.
- **Rolling analysis:** The system analyzes 52 weeks of rolling historical data, refreshed weekly, ensuring that optimization decisions reflect the most current demand patterns.
- **Segmentation framework:** SKUs are classified using an ADI-CV² framework (Average Demand Interval and Coefficient of Variation), an industry-standard approach that segments products based on their demand patterns.

Location ranking methodology

Our location optimization uses a multi-factor ranking approach:

- **Picking zone prioritization:** Locations are first ranked based on operational picking zones, with zones closer to outbound areas receiving higher priority.
- **Sequence-based distance calculation:** Within each zone, locations are ranked using picking sequence numbers to minimize travel distance.
- **Ergonomic considerations:** The system accounts for picking ergonomics, prioritizing locations based on their accessibility (e.g., B-level shelves often prioritized over A or C levels).
- **Specialized location types:** Pallet locations and prime pick fronts are specifically allocated to high-velocity items to maximize picking efficiency.

Data-driven analytical foundation

Our wave optimization uses advanced clustering and path minimization techniques:

- **Aisle minimization algorithm:** This algorithm identifies orders that can be grouped together to minimize the total number of aisles visited during picking.

- **Star aisle methodology:** For cluster picking, the system identifies frequently visited "star aisles" and groups orders that minimize the squared distance from these central points.
- **Pick sequence distance approximation:** Travel distance is calculated using pick sequence-based approximation, validated through real-world testing.
- **S-shape routing optimization:** Our algorithms are optimized for S-shape picking patterns, which are intuitive for pickers while still delivering substantial efficiency improvements.

System architecture

The warehouse optimization solution is built on a flexible architecture:

- **Modular components:** Slotting and wave optimization can be implemented independently or together, allowing for phased implementation.
- **API-based integration:** Local API with HTML user interface enables interaction with existing warehouse management systems.
- **Dashboard visualization:** PowerBI dashboard provides comprehensive visibility into SKU data, slotting recommendations, and performance metrics.
- **Parameter configuration:** The system allows for customization of key parameters including batch sizes, volume thresholds, and picking methodologies.

This technical foundation allows us to deliver substantial warehouse efficiency improvements with minimal disruption to existing operations. While sophisticated in its analytics and optimization techniques, the system is designed to be transparent and intuitive for warehouse operations teams.

About GEODIS

GEODIS is a global transport and logistics leader with a network spanning 120 countries and a direct presence in 67 countries through 350+ locations. We support clients by helping them overcome logistical constraints across all aspects of the supply chain.

Our services include:

- Transportation Management
- Warehousing Solutions
- Distribution and Fulfillment
- Freight Forwarding
- Contract Logistics
- Supply Chain Optimization

The warehouse optimization solutions detailed in this white paper reflect our data-driven approach to enhancing fulfillment operations. With our industry experience, we implement effective solutions to address even the most difficult logistics challenges.

For more information, visit [geodis.com/us-en](https://www.geodis.com/us-en)



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