



E-Guide

The four keys to better **load building**

Practical strategies for transportation efficiency

Inefficient load building silently erodes profits and customer trust. This guide explains the limitations of first-generation load planning technologies and highlights how modern approaches to load building are helping manufacturers and distributors improve utilization, reduce transportation costs, and execute more consistently.

In this guide

With real-world examples and measurable results, we show how data-driven technology empowers businesses to improve transportation performance through better planning decisions, higher utilization, and reduced costs.

Introduction

Overcoming the hidden costs of inefficient load building

Today’s supply chain and logistics professionals are expected to drive greater efficiency with fewer resources, all while upholding service and compliance standards. Yet a persistent challenge remains: inefficient load building slows down warehouse operations, increases miles driven and fuel used, and even puts vital customer relationships at risk due to late or incomplete deliveries.

Manual and first-generation load planning approaches might once have been sufficient, but today, they are outpaced by the complexity, speed, and volume of modern supply chains. As costs rise and customer demands intensify, the inefficiencies of legacy planning can represent a major profit drain.

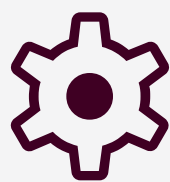
Modern supply chains need robust, data-driven solutions that integrate seamlessly into operations, automate complex decisions, and empower teams. The good news: modern load building approaches help organizations reduce waste, improve utilization, and make planning decisions with greater confidence.

This e-guide examines the evolution from first-generation to next-generation load building tools. We explore four critical focus areas – Order Optimization, Axle-Weight Compliance, Product Stackability, and Warehouse Execution – and demonstrate how new technologies improve transportation and warehouse performance. Real-world examples illustrate measurable gains and best practices that will allow your organization to harness the full potential of smarter load building.

”

The ability to effectively plan loads is the difference between profit and loss.

The challenges of traditional load building



- Inefficient and siloed planning
- Missed deliveries and opportunities
- Shipping air/empty miles



- Weight and load compliance issues
- Safety concerns



- More trips
- Higher costs
- Environmental impacts

From siloed, manual **planning** to a **smarter** approach

Traditional methods of load building – spreadsheets, instinct, and experience-driven planning – leave money on the table:

- Open pallet spots go unused
- Manual miscalculations lead to overweight loads
- Shipments are delayed by planning bottlenecks
- Environmental goals fall short

Overcoming these issues starts with having the right technology in place. With smarter tools – such as data-driven, automated load planning – you have an opportunity to improve transportation performance through better utilization and more consistent planning:

- Fill every available inch of trailer space with confidence
- Standardize loading processes across your team
- Reduce shipping costs and carbon footprint
- Win back time for planners and warehouse staff

Better planning decisions often start with better data

Optimizing loading efficiency and capacity is crucial for maintaining a competitive edge. Whether you're looking to improve your current processes or seeking new ways to maximize efficiency, this guide highlights practical approaches for improving load utilization and transportation efficiency.

Getting started: What to know before you optimize

Successful optimization starts with accurate data, real-world operational insights, and a change-ready culture that's aligned, informed, and supported.

- 1. Good data is fundamental.** Accurate data is the foundation of effective optimization. Make sure your SKU information (dimensions, weight, stackability rules) is clean and accurate.
- 2. Go beyond the desk.** Talk to your warehouse teams. Their “tribal knowledge” will surface real-world rules and exceptions that polished data sometimes misses.
- 3. Prioritize change management.** Introducing new tech and processes works best when teams understand the “why” and feel supported. Set clear expectations, get leadership buy-in, and foster an environment open to change.

Four keys to success with next-gen load building



1. Order optimization

Transforming loads from reactive to proactive



2. Axle-weight compliance

Safeguarding loads and reducing risk



3. Product stackability

Maximizing load density without sacrificing safety



4. Warehouse execution

From manual bottlenecks to standardized excellence



1. Order optimization

Transforming loads from reactive to proactive

Order optimization plays an important role in creating consistent, cost-effective shipments. The concept of load optimization is not new by any means. It’s been around for a very long time. What is new is when and where in the supply chain process that optimization takes place.

The challenge with traditional tools

First-generation load building solutions typically operate at the transportation planning or execution phase, after orders have already been decided and handed off. At this late stage, planners can only re-configure existing loads with whatever orders are present, limiting opportunities to combine, split, or re-size shipments for maximum efficiency. Common issues include:

- Underutilized trailer space from fixed order sizes
- Increased empty miles and transportation costs
- Time-consuming manual trial-and-error, often relying on the experience of individual planners

Second-generation capabilities

Modern load building starts “upstream” – at the order creation phase – moving you from a reactive approach to load optimization to more of a proactive approach when building optimized shipments through concepts such as Stock Transfer Orders, Mega Orders, Pull-Ahead Orders, and Filler Demands.

By optimizing not just how to load orders, but which orders to create and how to combine them, next-gen solutions allow for:

- Proactive order bundling for more efficient loads
- Dynamic order manipulation (splitting, merging, resizing) before planning finalizes
- Continuous adjustment using real-time data (inventory, sales priorities, shipment deadlines)

What sets ORTEC apart:

ORTEC optimizes at the demand level, allowing you to create and consolidate actual orders. This approach enhances efficiency and drives proven results, resulting in increased load density. Let’s explore these proactive concepts and the role they play in advanced load optimization.

- Stock transfer orders
- Mega orders
- Pull-ahead order
- Filler demands

Real results

A leading CPG manufacturer, already using a first-gen tool, switched to a next-gen order optimization platform. Despite having highly skilled planners, the technology delivered an additional 5% reduction in shipping costs, simply by enabling smarter, earlier decisions on order composition and truckloads.

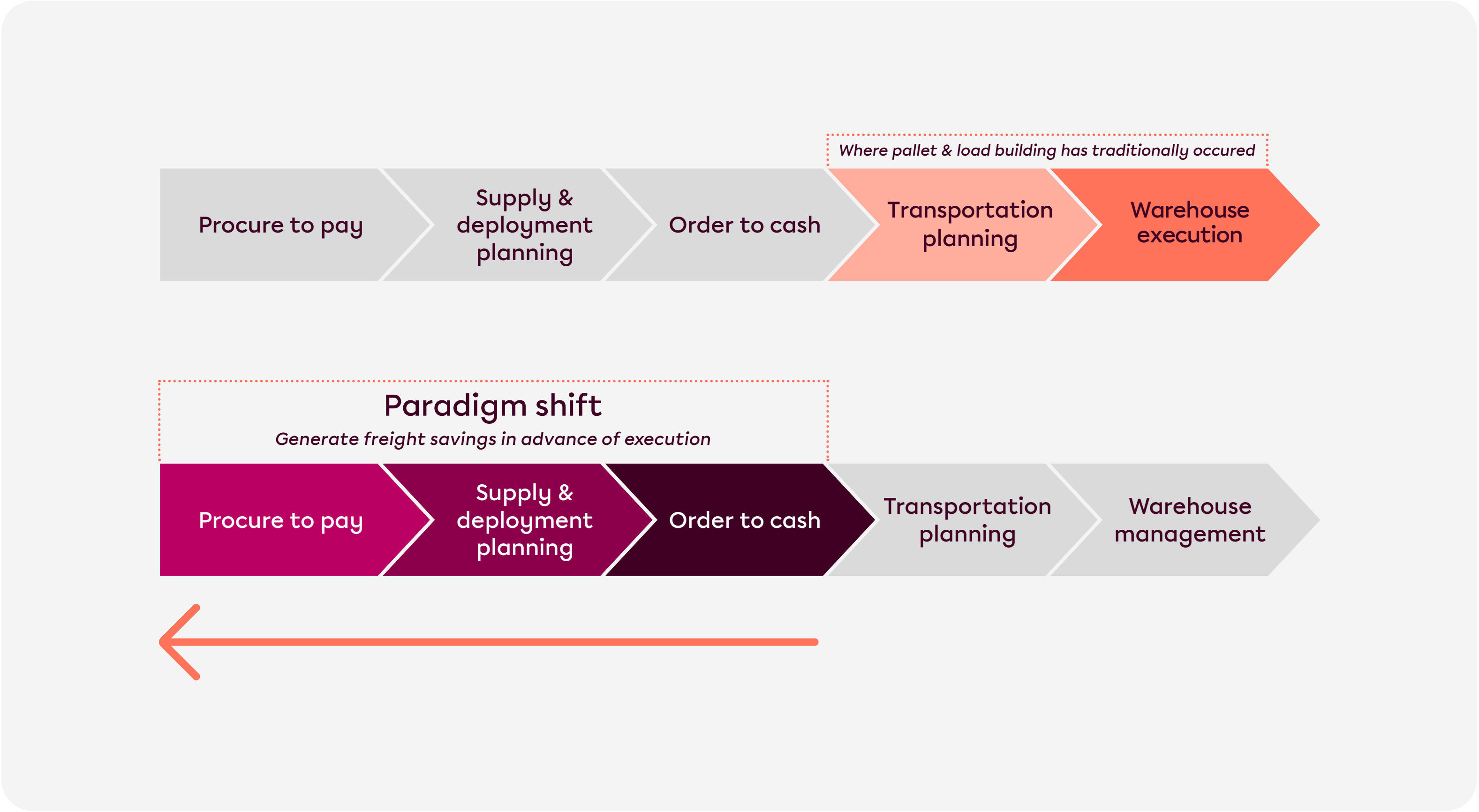
How ORTEC contributes to efficiency gains:

- Maximized trailer utilization: Fewer trucks, more product per trip.
- Reduced fuel and labor costs: Less wasted capacity and time.
- Faster, standardized planning: Lower reliance on individual knowledge.

Shift load building upstream to identify freight savings earlier in the planning process

Traditionally, pallet and load building have been handled late in the process – after transportation planning begins – limiting opportunities to fully optimize orders and reduce freight costs. Order Optimization involves a different approach to load building: moving the process upstream into supply, deployment, and order planning phases.

By taking a proactive approach to order management, you can identify cube and weight efficiencies earlier, identify freight savings before execution, and create more efficient transportation plans and warehouse operations.



Advanced planning versus execution

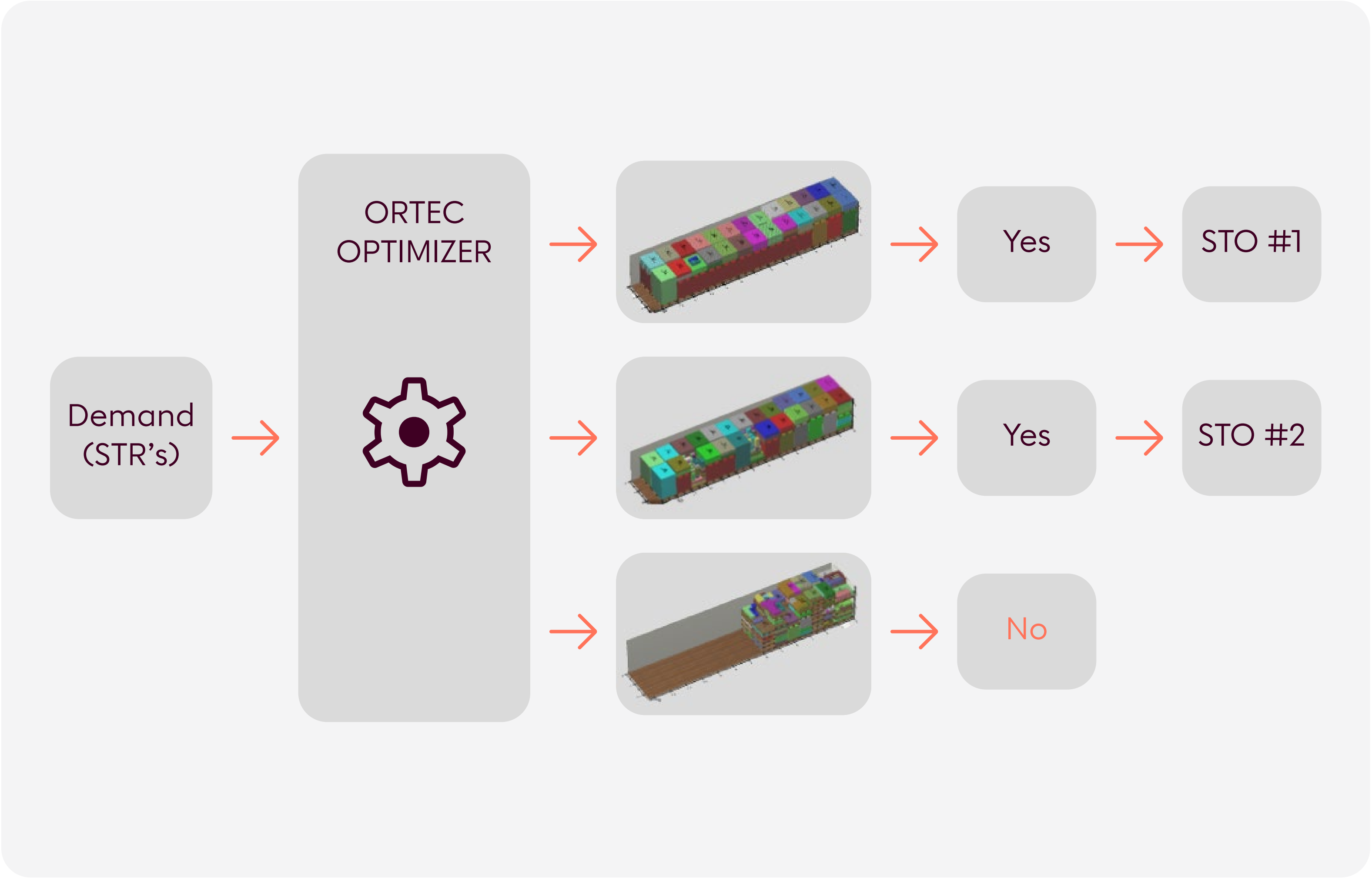
Optimizing demand from STOs

By optimizing at the demand level – before stock transfer orders are finalized – you will make the most of every shipment.

Advanced load building tools take early stock transfer requisitions (STRs) and automatically run them through powerful algorithms.

These systems test thousands or even millions of possible pallet and trailer configurations, considering factors like pallet type and height, stacking rules, trailer type, and axle positioning. The end result, as illustrated below, is the most efficient possible load, created right from the start.

This proactive approach ensures optimal use of space, reduces costs, and ensures that each transfer order is built for maximum efficiency before it ever leaves the planning stage.



Optimize demand from STOs

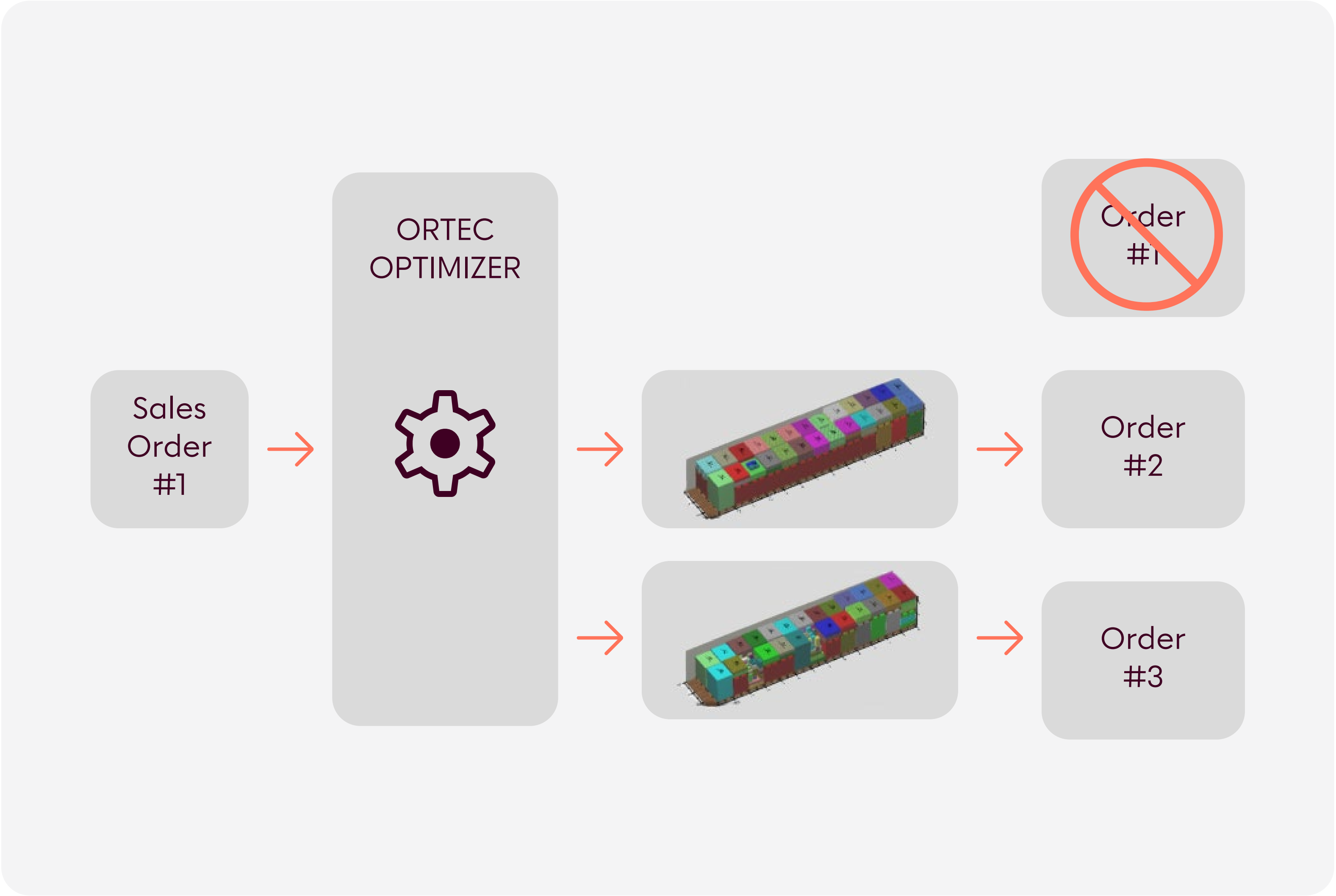
Using smart splitting to optimize mega orders

Turn complex, multi-truck “mega orders” into efficient, cost-saving shipments automatically with advanced load optimization tailored to each customer’s requirements.

Large customers often place “mega orders” that require several full truckloads to fulfill. Manually dividing these large orders into efficient, cost-effective shipments is complex and time-consuming, especially when each customer has unique shipping needs.

With advanced load optimization, the system automatically analyzes customer-specific requirements and breaks mega orders into optimized, manageable shipments.

As shown below, this ensures each truck is loaded efficiently for that customer, saving time, reducing costs, and delivering consistent results every time.



Turn mega orders into optimized shipments

Maximizing efficiency with pull-ahead orders

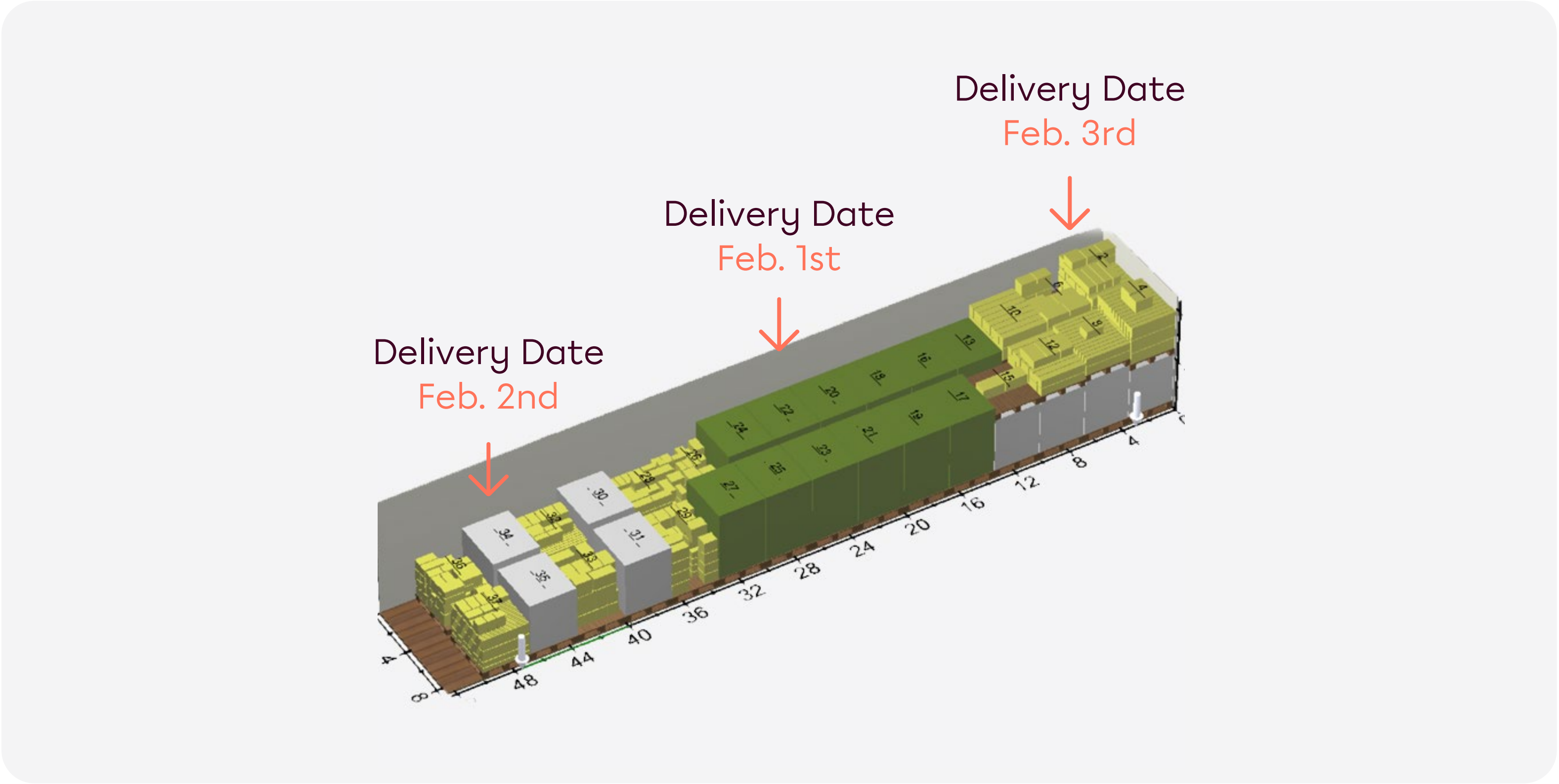
Pull-ahead order optimization fills more trucks and cuts costs by combining compatible shipments to maximize capacity, reduce expenses, and keep customers happy – all within their delivery requirements.

Often, customer shipments scheduled for the same destination on separate dates don't fully utilize available truck space. Pull-ahead order optimization solves this by automatically combining orders from nearby delivery dates, within the customer's delivery windows, to create fuller, more efficient truckloads.

For example, in the illustration below, if a shipment scheduled for February 1st doesn't fill a truck, later orders for February 2nd and 3rd can be “pulled ahead” and combined, as long as it meets the customer's requirements. This approach is fully automated within systems like

SAP and support customizable approval thresholds, such as auto-approving loads that reach 98% of weight capacity or 70% of volume.

As a result, pull-ahead optimization helps companies reduce total shipments, cut costs, and improve supply chain efficiency, all while honoring customer needs.



Combine orders for fuller, more efficient truckloads (colored by delivery date)

Creating fuller loads with filler orders

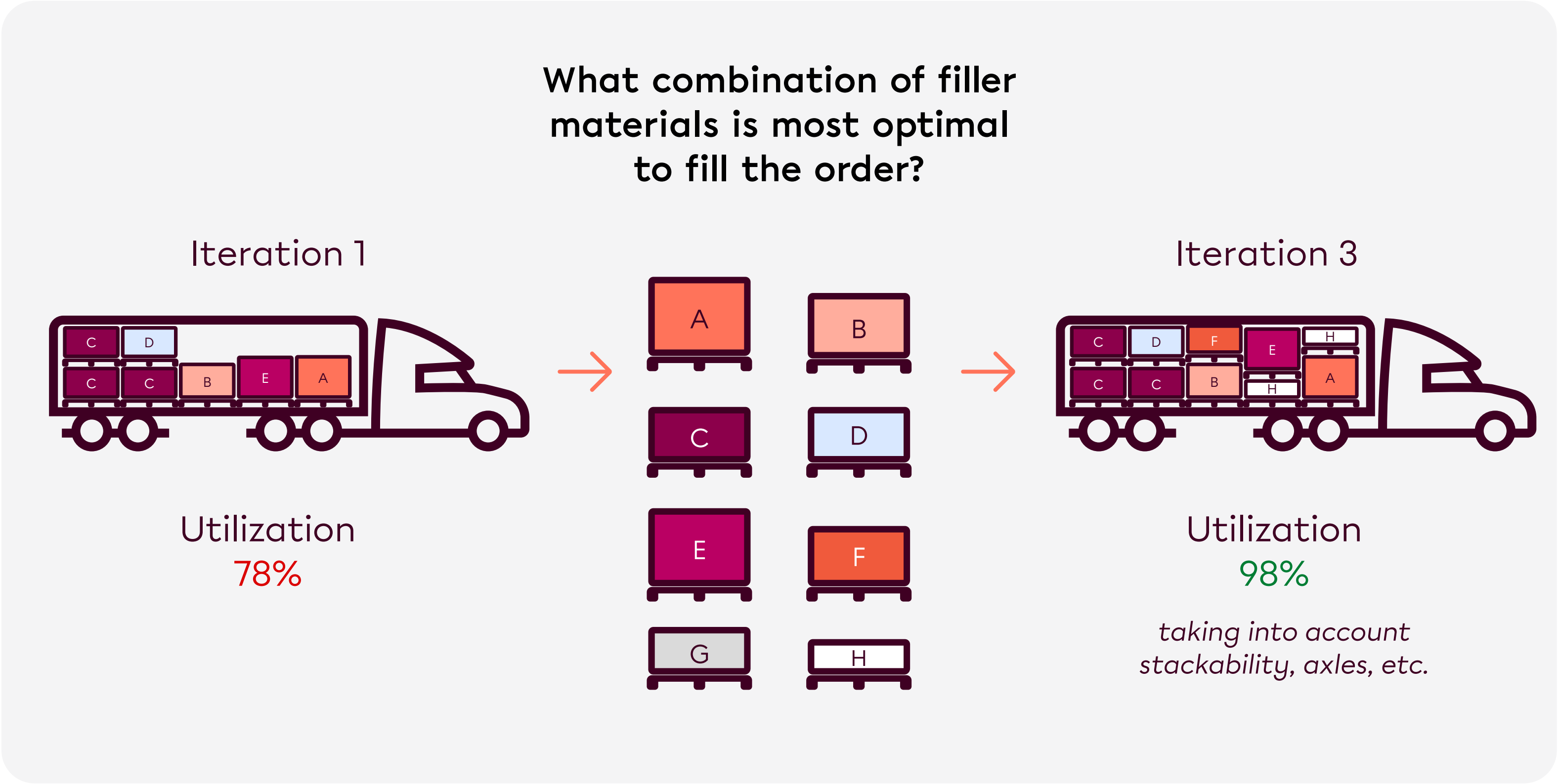
Turn partially filled trucks into cost-saving, full loads by automatically adding the right filler products for optimal space and efficiency.

Filler orders help ensure that every shipment uses as much truck space as possible. When a customer order only fills part of a truck – for example, just 78% utilization – adding high-velocity filler items (specific SKUs and quantities provided by customers) fills the empty space. In one case, the optimizer analyzed six different purchase orders, automatically mixing and matching products to boost the truck’s fill rate from 78% to 98%. In reality, customers often provide a larger pool of potential filler products.

While some companies try to manage this manually, determining the best combination of products is complex and involved considering stackability, axle weights, and

product interaction. Advanced optimization software solves this instantly, evaluating hundreds of possible combinations to create the most efficient truckload.

This reduces the number of trucks on the road and cuts transportation costs and simplifies planning to make every load count.



Transform empty space into time and cost savings



2. Axle-weight compliance

Safeguarding loads and reducing risk

Axle-weight compliance goes beyond meeting legal requirements. It's critical to protecting drivers, equipment, and cargo while avoiding costly fines and delays. Advanced load optimization automatically factors in axle-weight limits during planning, ensuring every load is safe, compliant, and efficient before it ever hits the road.

The challenge with traditional tools

Manual planning and early digital tools often focus purely on maximizing cubic capacity. They frequently overlook regulatory and safety requirements like axle weight distribution – putting your company at risk. Planners can inadvertently create overweight or improperly balanced loads, resulting in:

- Risk of costly fines at weigh stations
- Load rejections or forced rework on the dock
- Safety and liability concerns

Second-generation capabilities

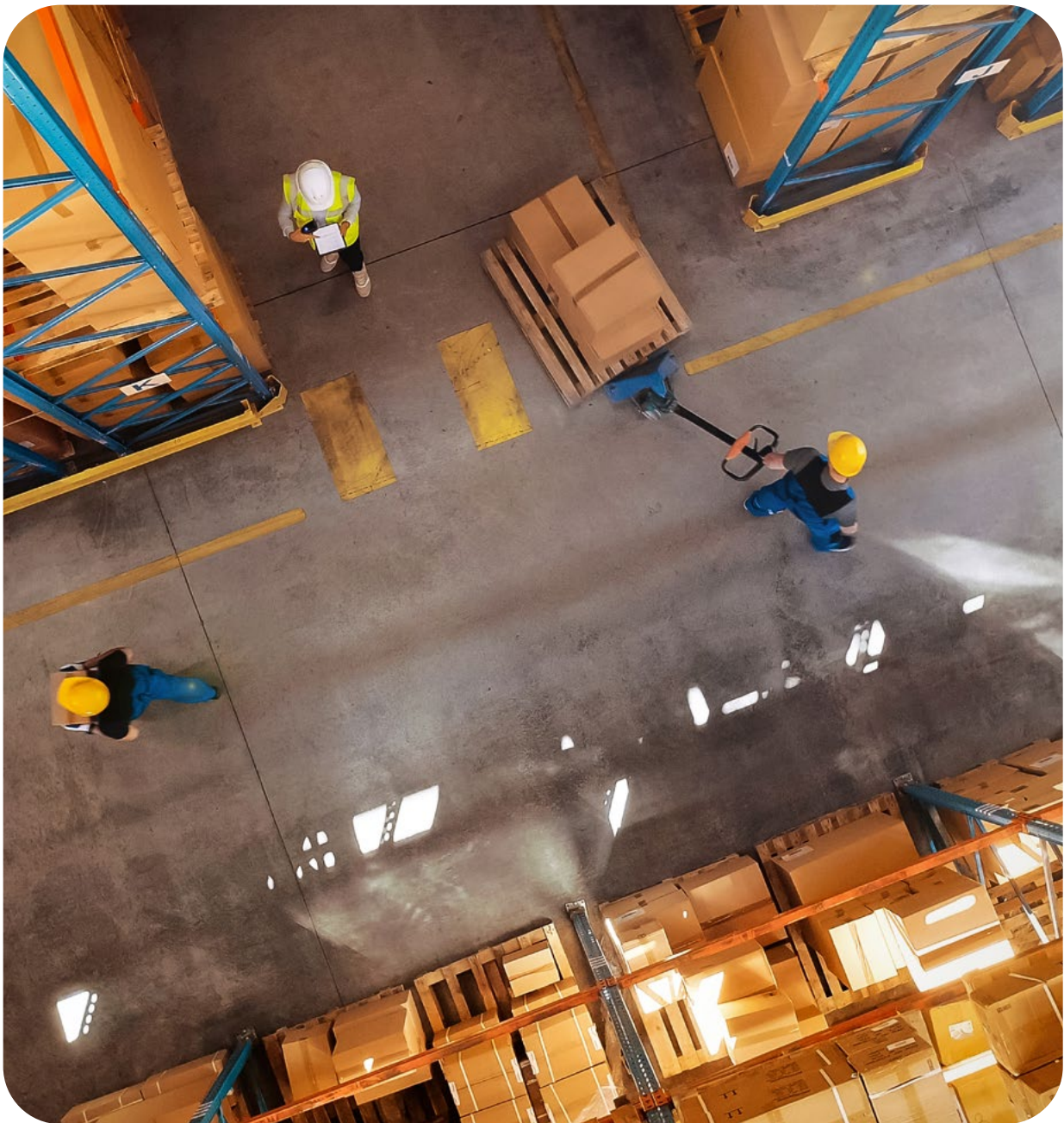
Modern solutions automate compliance with axle weight laws (e.g., US DOT, EU regulations) as an integrated part of load planning to reduce fines and instill greater confidence in planners and drivers.

- Advanced algorithms ensure every load plan conforms to total and per-axle weights
- Automated alerts and adjustments before loading begins
- Simulations and “what if” analyses to compare compliant scenarios



What sets ORTEC apart:

Our solutions are algorithm-driven, providing precise weight calculations. Features like sliding axles and heavy loading patterns ensure optimal weight distribution, enhancing compliance and operational efficiency.



Real results

Foodservice and beverage distributors have leveraged these tools to virtually eliminate fines, while ensuring driver and public safety – achieving both regulatory peace of mind and higher load factors.

How ORTEC contributes to efficiency gains:

- Avoids costly delays and penalties: Plans are compliant from the start.
- Prevents last-minute rework: Reduces load/unload cycles and dock congestion.
- Enables higher safe utilization rates: Move more product per trip with better compliance.

Building safer, more compliant loads

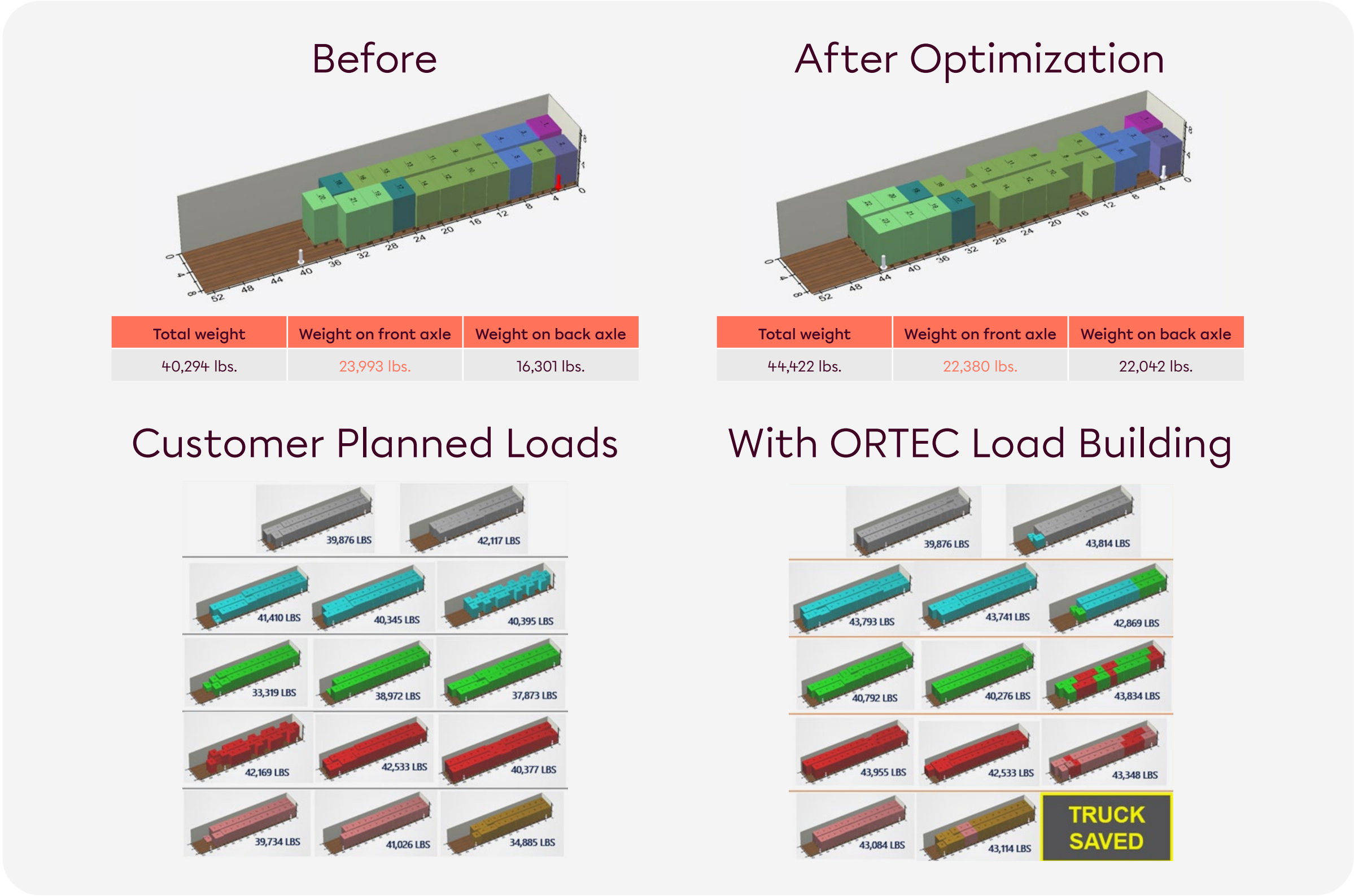
Advanced axle-weight optimization makes it possible to safely load to full capacity, eliminating the costly practice of leaving valuable space empty to avoid risking axle overloads. Many companies are (overly) cautious, limiting the weight per truck to avoid the potential of exceeding axle limits. ORTEC’s advanced axle and truck optimization allows them to build up to full capacity – adding one or two more pallets per truck.

Instead of double-stacking pallets at the nose of the truck, our ‘bell curve’ optimizer double-stacks in the middle with a dynamic 21212 load pattern and, depending on the the products on the truck, uses airbags on each side. This takes stress off the front and back axles, allowing the addition of more pallets.

For example, a company limited its 45,000 lb. capacity trucks to only 90 to 93% full. The side-by-side comparison of activity on a single lane, with two to three shipments per day, shows the results of their traditional front-stacked model versus our optimized load. The colors represent delivery dates. Using pull-ahead orders and axle functionality, ORTEC added one to two pallets per truck.

By the 14th load, enough pallets were added to previous loads to eliminate the need for an entire truck, taking it off the road.

They gradually worked up to the full capacity, and over the next few months, the customer saw a 7% reduction in truckloads required.



Increase capacity with smart axle-weight management



3. Product stackability

Maximizing load density without sacrificing safety

Stacking products in a trailer isn't as simple as it looks – especially when every SKU comes with its own rules and handling limits. ORTEC's advanced load building takes the guesswork out of stackability, applying rules consistently across products and shipments. It embeds on-the-floor expertise and detailed product constraints into the planning process to maximize capacity, protect product integrity, and boost efficiency with every load.

The challenge with traditional tools

Legacy load planning often assumes a simplistic model for how products are stacked or grouped. In reality, SKU-level restrictions (fragility, stack height limits, packaging dimensions, orientation rules) are complex. Without strong stackability controls, organizations risk:

- Product damage and returns
- Unpredictable/underutilized trailer space
- Unsafe or non-compliant load plans
- Inefficient or inconsistent planning across teams

Second-generation capabilities

- Advanced solutions incorporate detailed, SKU-level stackability and compatibility rules to improve efficiency and maximize capacity.
- Automatic recognition of stacking rules, constraints, and exceptions for each item or product group
- Dynamic 3D visualization to validate the load as it would be physically built
- Ability to simulate alternative stacking scenarios for best fit
- Maximized vertical space without exceeding product integrity limits
- Improved safety and quality upon arrival, lowering claims and damages



What sets ORTEC apart:

ORTEC lets you embed stackability rules for any product, ensuring full load density without the risk. Every item’s handling requirements are respected, every load is both dense and safe.



Real results

A global consumer goods company reduced product damage claims by 30% after deploying advanced stackability logic—while simultaneously improving the average fill rate of each trailer.

How ORTEC contributes to efficiency gains:

- Reduces losses: Fewer damaged goods and returns.
- Improves capacity: More effective use of cubic space and legal height.
- Standardizes safety: Better load security and stability and safer building processes.

Optimizing capacity with stackability

Warehouse teams often hold valuable operational knowledge that doesn’t always exist in system data. Their collective experience – or ‘tribal knowledge’ – offers a great opportunity for loading operations. However, it also presents challenges. With high turnover, experienced loaders have to be taken off forklifts to train new hires. This learning curve may take one to nine months, resulting in lost time. Second, while someone at the warehouse might have this knowledge, the planners building the loads, often located elsewhere, might not. The planners will often build loads more conservatively.

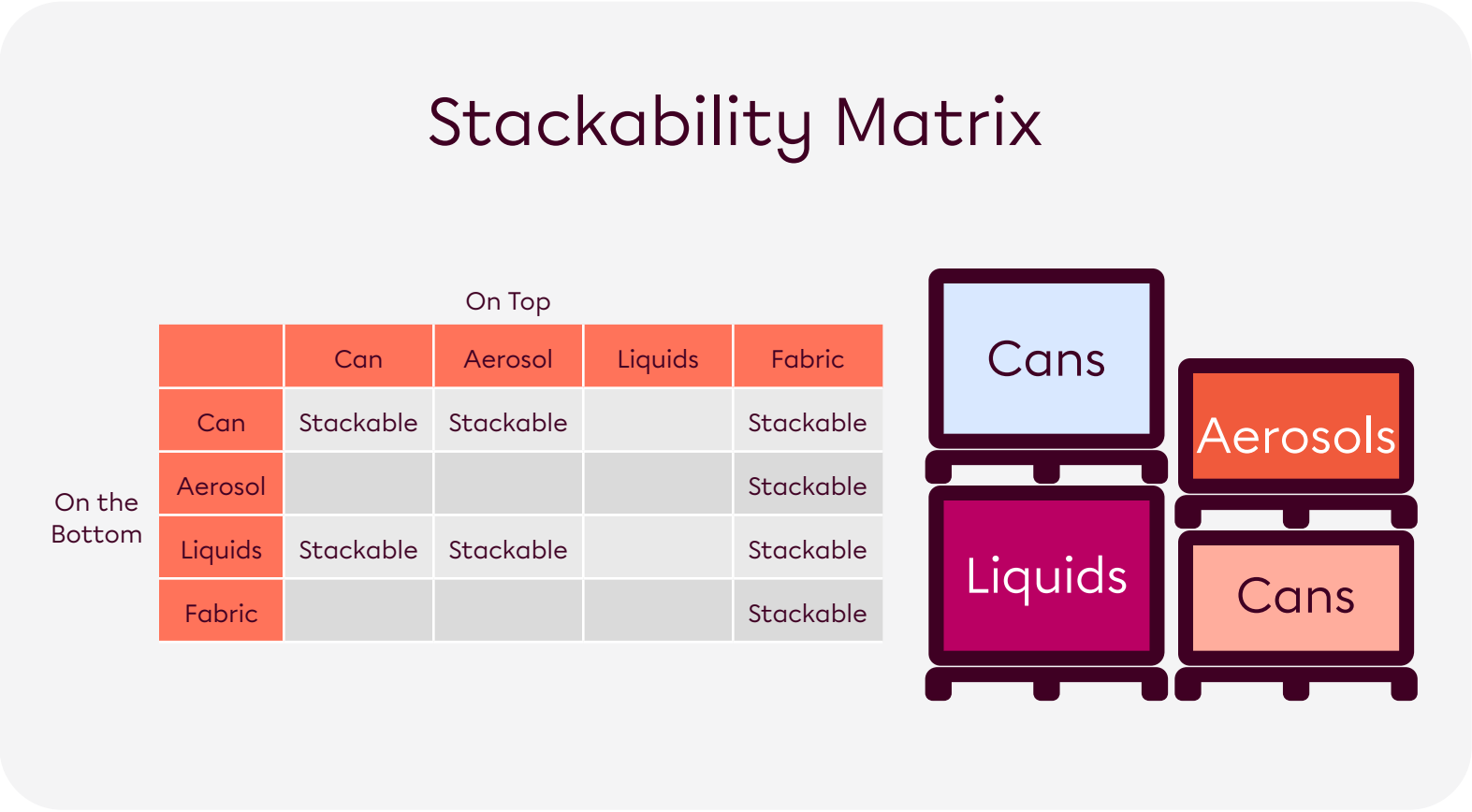
ORTEC harnesses this on-the-floor expertise. with advanced that captures and applies this operational knowledge consistently. We take the tribal knowledge from across your warehouse organization and incorporate it into our optimizer, ensuring that your load planners have

have access to this same knowledge to build the maximum loads. Two of the primary tools we use to distribute this knowledge are the Stackability Matrix and Max Support Weight.

Stackability matrix

ORTEC's Stackability Matrix translates complex, SKU-level handling rules into a format that planners and optimization algorithms can use instantly and consistently. It’s essentially a digital rulebook that captures how different product groups interact when stacked – ensuring every decision respects operational realities, product integrity, and safety standards.

We start by grouping products based on key physical and handling attributes, such as packaging type, fragility, shape, and weight-bearing capacity. Each group is then tested against every other group in a compatibility grid to determine if it can sit above or below another in a stack.



Make smarter stacking decisions, every time

For example, can aerosol stack on liquids? Yes. Can liquid stack on fabric? No.

The matrix removes subjectivity from planning, and ensures stackability decisions are consistent across locations, shifts, and teams.

Max support weight

While the Stackability Matrix defines whether one product group can be stacked on another, the Max Support Weight method determines how much weight each layer, pallet, or product type can safely carry without damage. This takes stackability beyond a simple yes/no and into precise, data-driven weight calculations.

Here’s how it works: Every SKU or product group is assigned a maximum supported weight value, based on packaging strength, material durability, and pallet configuration. The optimizer evaluates the load layer by layer, identifying the weakest layer in the stack. This becomes the limiting factor for the entire pallet. The algorithm dynamically arranges products so weight is distributed optimally, avoiding overloading any pallet or product. For example: If a mid-layer product can only support 400 lbs., the optimizer will never place products exceeding that total weight above it, regardless of whether the Stackability Matrix says they’re “compatible.”

This method often uncovers hidden stacking potential for products previously considered unstackable by manual planners. In practice, Max Support Weight frequently allows ORTEC to add three to five extra pallets per truckload – whether for stock transfer orders or direct customer shipments – without compromising product safety.

Max support weight

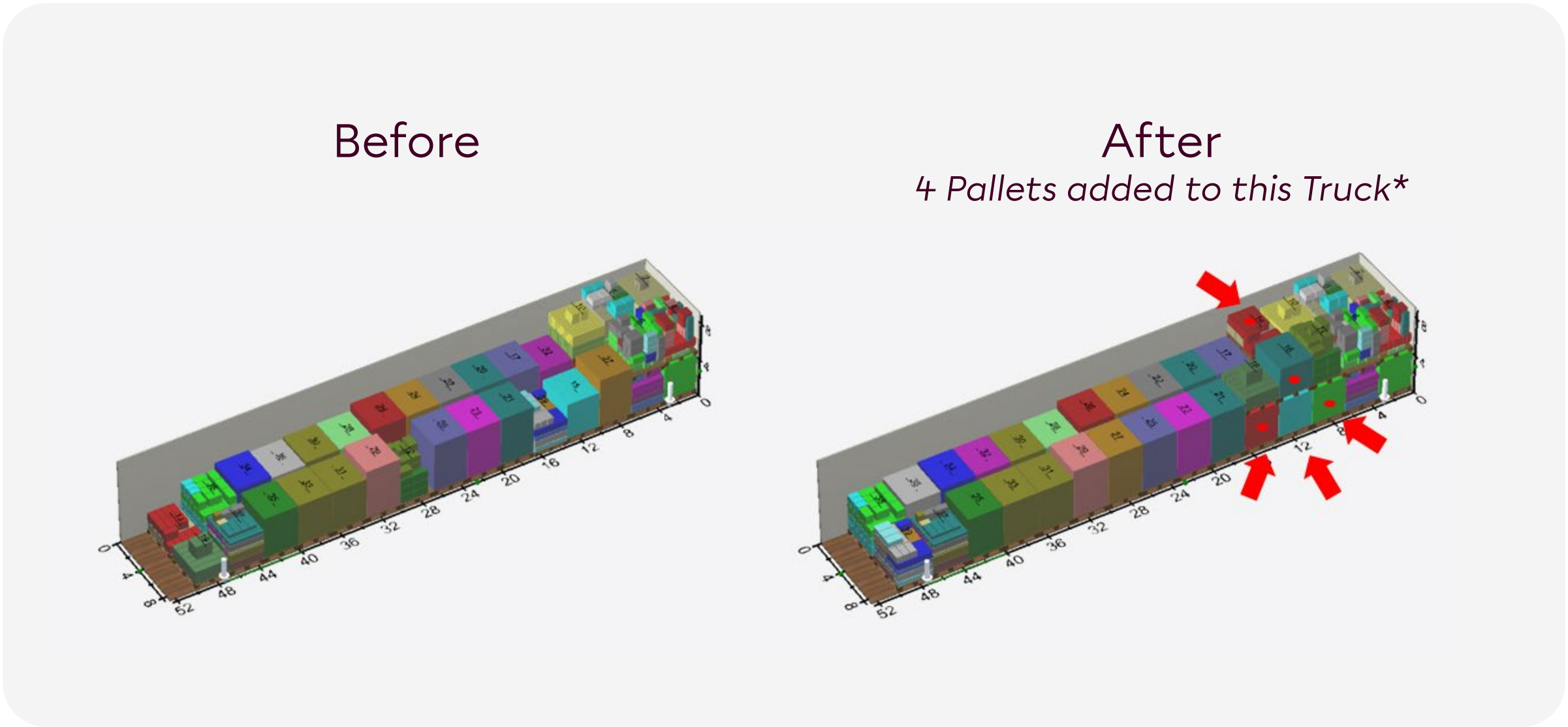


Ensure every layer carries its load safely

More pallets per load, safely and efficiently

Why are stackability and max support weight important? Many customers have hundreds of thousands of SKUs. While it's easy to know that a heavy product can't stack on a light one, it's harder to determine stackability in the middle layers.

By combining the compatibility rules of the Stackability Matrix with the weight-bearing precision of Max Support Weight, ORTEC creates load plans that are both denser and safer, ensuring maximum utilization while minimizing the risk of product damage, claims, and rework. In our before and after example below, we were able to add four pallets to a truckload, improving efficiency while conforming to all loading rules.



Combine rules and precision for safer, denser loads





4. Warehouse execution

From manual bottlenecks to consistent execution

Even the most efficient load plan depends on consistent execution. ORTEC helps standardize this final step by replacing inconsistent, tribal-knowledge-based loading with clear, visual, and uniform instructions – providing warehouse teams with clear, consistent instructions to build optimized shipments quickly, accurately, and consistently across every location.

The challenge with traditional tools

The goal here is to execute the planner-created plan in the warehouse. Even the best plan can fail if not executed properly. First-gen systems often lack clear, actionable guidance for front-line staff. You may have different rules being used by DC locations and different loaders loading differently based on tribal knowledge. And you have no way to understand why some locations performed better than others. Common issues include:

- Confusing or incomplete loading instructions
- High reliance on “tribal knowledge” and senior loaders
- Long training times and high turnover
- Inconsistent execution leading to shipping errors

Second-generation capabilities

With defined, uniform rules and easy to follow loading visualizations, your warehouse shifts from reactive problem-solving to more consistent execution – shipping more, faster, with fewer errors.

Next-generation solutions provide:

- Clear visual instructions that eliminate guesswork, accessible by any team member
- Step-by-step digital workflows tailored to actual dock layouts
- Real-time progress tracking and adaptation for last-minute changes
- Reduced dependency on key individuals, enabling flexible staffing



What sets ORTEC apart:

ORTEC’s end-to-end platform optimizes loads and integrates actionable instructions and real-time collaboration, closing the loop from planning to execution. Every shipment has a clear loading plan, and loaders are able to see exactly how to orient the pallet, how to stack it, how to slide axles, and other details. The result is consistently-built shipments from location to location.

Real results

A retail distributor reduced average new-hire training times by 40% after introducing digital load building workflows, resulting in smoother peak season ramp-ups and more consistent execution across multiple sites.

How ORTEC contributes to efficiency gains:

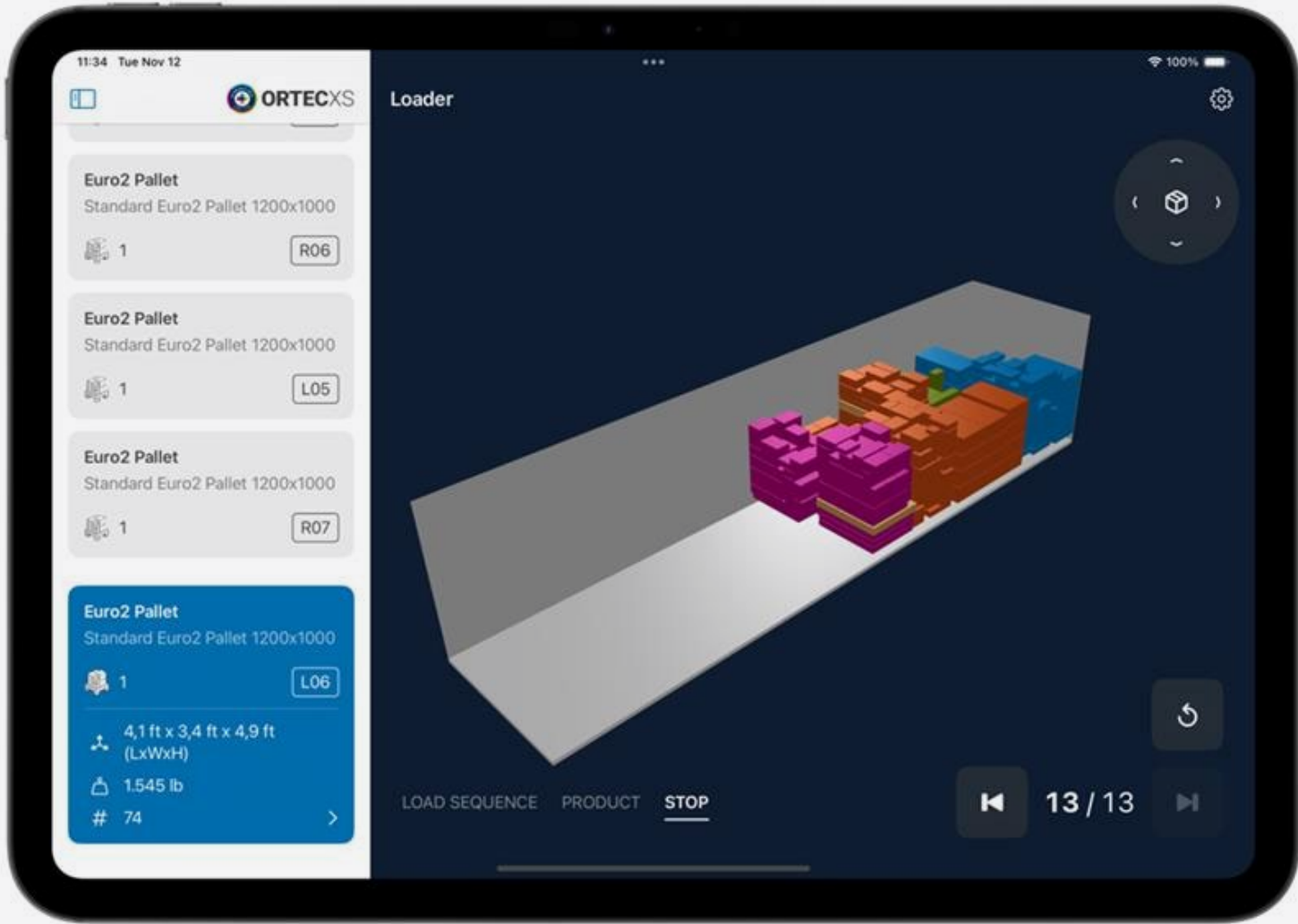
- Boosts productivity: Less time spent planning and reviewing.
- Reduces errors: Automated instructions ensure shipments are correct.
- Improves morale: Empowers teams and shortens onboarding curves.

Accelerate training and improve loading consistency

As an added benefit, training for new loaders takes days, instead of months, without pulling experienced loaders off their lifts, decreasing not only training time but also inconsistent or underutilized shipments.

3D loading plans show exactly how to build every shipment. This can be as simple as a printout or a workstation display. We also have a best-in-class approach where we send graphics, rules, and constraints to a handheld electronic device (such as shown here on an iPad running iOS). Loaders see exactly what the trailer looks like and go pallet by pallet. It provides a description of the pallet, dimensions, weight, how it needs to be turned, and if it needs to be stacked. For example, “L06” means left-hand side, sixth slot back. It makes executing the optimized shipment plan virtually foolproof.

Along with the pallet bills, we also allow customers to use automated warehouse pickers to build pallets based on our plans. AGV forklifts – which are being deployed more widely – can also use the loading instructions.



Load faster with line by line loading instructions

What **successful** load building looks like

Effective load planning can have a significant impact on transportation costs, efficiency, and service performance. It substantially cuts transportation costs, boosts supply chain efficiency, and enhances customer service.

Effective load planning can make or break a business and improve utilization and reduce transportation costs across the network. Getting more into trailers and taking trucks off the road will substantially cut transportation costs.

With modern load planning tools, high-performance results are achieved by optimizing at the demand level – using high-velocity fill items, eliminating safety buffers (such as leaving pallet spots open due to a lack of trust in loaders), providing loading instructions, removing dependence on tribal knowledge, and standardizing loading across locations.

Pallet by pallet, the savings add up quickly, especially for high-volume companies. Small improvements in utilization can create meaningful savings when applied consistently across a transportation network. Highly automated, even fully black-boxed, systems that allow planners to function as analysts instead of manually touching every load substantially boost supply chain efficiency.



ORTEC's data-driven solutions create measurable impact through advanced technologies and a collaborative partnership approach. Leading companies using our next-generation load building report significant results that drive cost savings.

When planners have the right data, rules, and optimization tools, complex loading decisions become simpler to manage and easier to execute consistently.

- Higher trailer fill rates (up to 10 - 20% more utilization)
- Fewer shipments (and miles) per delivered product
- Improved standardization of rules and reduced fines and compliance violations
- Dramatically less time spent planning and troubleshooting (up to 50 - 75% improvement)
- Significantly faster training time for new planners and loaders
- More predictable, satisfied customers
- Greater insights to support continuous improvement



FAQS: Next-generation load building

Answers to common questions

What are the most critical elements to consider before using load-building optimization?

The most important factor is data quality. “Garbage in, garbage out” applies – accurate SKU data (dimensions, weight, stackability, special rules, etc.) is required to achieve the full benefits of optimization. Spend time upfront validating your product master and gather insights from warehouse staff to capture undocumented rules and practices. Change management is also vital: proper communication and executive buy-in set your project up for success.

How does ORTEC handle changes in my business, such as new product launches or evolving customer requirements?

ORTEC solutions use advanced analytics, so you gain granular visibility into how each business change impacts your planning and operations. The system can quickly adapt to new SKUs, customer rules, or evolving shipping practices, keeping your optimization aligned with real-world needs.

How does ORTEC address training for new loaders and planners?

With standardized loading rules and clear, visual load instructions, ORTEC reduces new loader training time by up to 75 - 90%. The system guides execution step by step, so less ramp-up is needed – even for complex, high-SKU operations. Planners become analysts, focusing on value-adding exceptions rather than manual load setup.

What makes ORTEC different from other load building technology vendors?

- ORTEC combines advanced algorithms, deep industry experience, and end-to-end integration:
- Supports rich, dynamic rules at the SKU level (not just broad categories)
 - Optimizes both cube and weight, including detailed axle compliance
 - Delivers clear warehouse execution instructions with minimal reliance on “tribal knowledge”
 - Scales across complex, multi-site networks
 - Empowers continuous improvement with robust analytics and reporting

How do I get started to see how ORTEC would work for my supply chain?

Schedule a demo or personalized consultation with our manufacturing optimization specialists. We'll assess your current processes and identify immediate opportunities for savings and efficiency.



Why ORTEC?

ORTEC helps supply chain organizations improve transportation planning through a combination of advanced optimization, operational expertise, and practical AI capabilities. While AI’s potential is rapidly evolving, we focus on applying AI where it delivers measurable operational value to deliver unmatched accuracy and efficiency, grounded in proven, real-world performance and results you can trust today.

Our approach combines technology, industry expertise, and adoption support to help teams get value from optimization faster. We’re committed to driving your organization’s transformation through tailored solutions and proven adoption strategies that align with your specific business goals.

With ORTEC, you are investing in a flexible platform that helps teams adapt to changing operational requirements and opportunities for improvement with actionable insights and fosters seamless collaboration. You’ll be able to identify and leverage new opportunities for growth and process enhancement.

Ready to improve load building performance?

Learn how modern load building can help improve utilization, reduce transportation costs, and support more consistent execution. Learn more about ORTEC’s powerful load building solutions and how we’ll help you reduce costs and optimize efficiency.

About ORTEC

ORTEC is a global leader in advanced analytics and optimization solutions, delivering powerful tools and expertise to improve load building performance for logistics and supply chain operations. Our innovative software and consulting services help organizations optimize palletization, maximize trailer fill, comply with axle weight limits, and ensure safe, efficient, and consistent warehouse execution. By integrating real-world operational knowledge with AI-driven optimization, ORTEC enables better planning decisions, more consistent execution, and measurable reductions in transportation costs and emissions.

For more information about how ORTEC can help you improve load building efficiency, safety, and profitability, visit our website or connect with our team of supply chain optimization specialists.

Contact us to get started



•• ORTEC