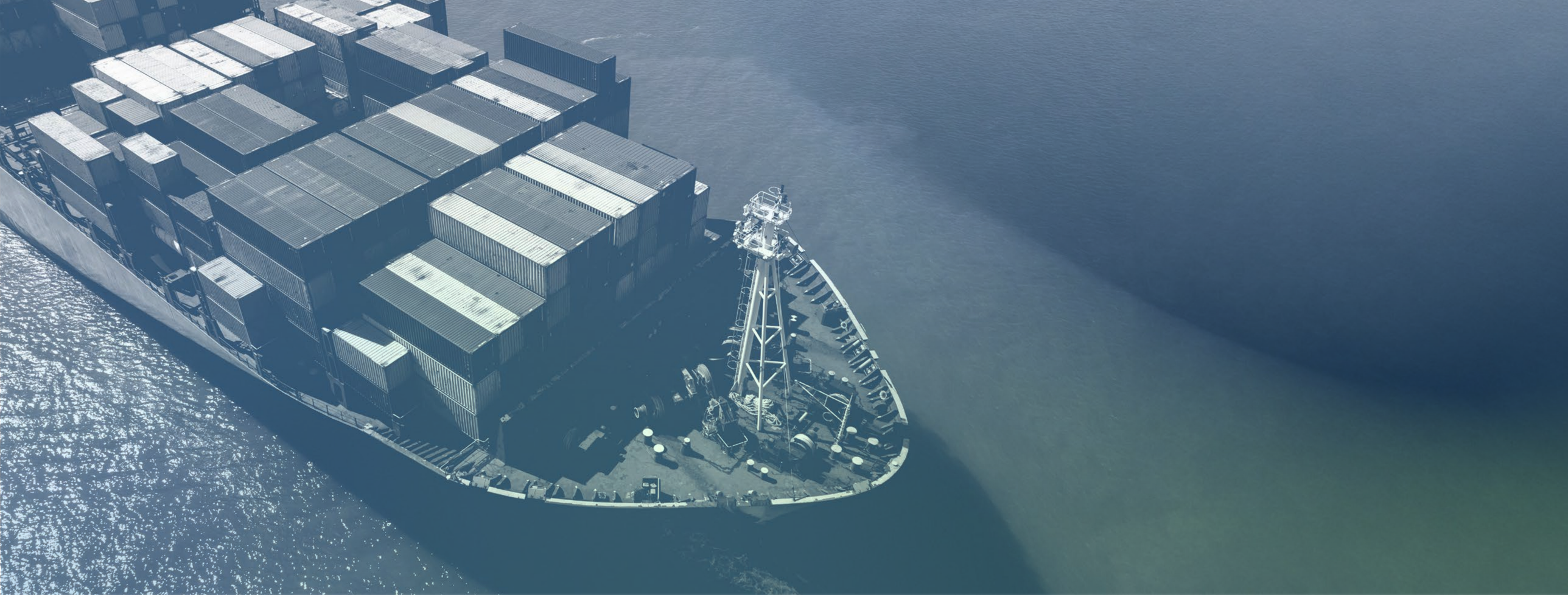

Case Study

From Brand to Performance: Uncovering Hidden Optimization Opportunities in Carrier Selection

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The Business & The Challenge

Our client regularly ships cargo from one of the major Chinese ports to a major U.S. port located on the Pacific Coast of North America. While the carrier and shipping volume remained consistent over the past twelve months, the carbon footprint increased unexpectedly.

The Client's Question:

"I used the same carrier last year for the same volume of shipments, but my emissions have increased. Why?"

This case-study reflects a fundamental challenge facing supply chain leaders: carrier brands don't guarantee consistent performance. Service selections, vessel assignments, and routing decisions can vary significantly, creating emissions variability that traditional calculation methodologies based on averages and historical data completely miss.

How VesselBot Approached the Problem

Using VesselBot's Digital Twin technology and real-time AIS tracking, we analyzed the client's specific route during the first half of 2025. By analyzing primary data on shipping voyages and liner schedules, we established that the carrier service used by our client was operated 31 times by 6 different vessels during H1 2025. The service ranked **fourth out of six** in emissions efficiency, recording an average intensity of **93.9 g CO2e per TEU km**.

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Understanding Voyage Efficiency: What Creates the Variance

Multiple interdependent factors determine voyage efficiency. VesselBot's Digital Twin technology captures all these variables in real-time:

Vessel Capacity & Utilization
Larger vessels with higher container loads achieve lower emissions intensity because the total fuel consumption is allocated across more containers, reducing each container's share.

Distance & Route Optimization
The most efficient route travels directly from origin to destination. Services with multiple intermediate stops increase total distance traveled, negatively impacting efficiency.

Vessel Age
Even under identical operational profiles, newer vessels typically outperform older counterparts due to improved hull designs, more efficient engines, and better-maintained propulsion systems.

Port Time
Vessels consume fuel while in port without making progress on the voyage. Extended port stays increase total fuel consumption while contributing zero to productive transport, thus worsening emissions intensity.

Speed Management
Each vessel is designed with an optimal cruising speed. Deviating from this optimal speed (either faster or slower) reduces fuel efficiency and worsens emissions intensity.

Voyage Duration
Longer voyages generally achieve better intensity metrics, but this is influenced by the relationship between distance covered, speed maintained, and port time, all of which VesselBot tracks in real-time.

Why this matters:

Industry-average tools cannot account for these variables because they assume all services perform identically.
VesselBot's vessel-specific Digital Twins capture how each of these factors affects every single voyage, delivering measurement accuracy that reflects operational reality.

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Our Strategic Analysis: Optimization Scenarios

VesselBot's Supply Chain Sustainability Platform enabled comprehensive scenario testing to give our client a complete view of their optimization options. Apart from the historical analysis requested by our client, we suggested a real-time data approach scenario to maximize efficiency in the near future:

	Frequency	Emissions Intensity	Improvement	Key Efficiency Drivers	Main Trade-off
Scenario 1: **Carrier A**	3 voyages per month on average	Ranging from 48 to 168, depending on the vessel – 92.7 g CO_2e per TEU km on average	1% reduction vs current service 93.9 → 92.7	High utilization rate	Increased volatility in emissions intensity
Scenario 2: **Carrier B**	3 voyages per month on average	Ranging from 58 to 85, depending on the vessel – 71.7 g CO_2e per TEU km on average	24% reduction vs current service 93.9 → 71.7	Higher vessel capacity and increased utilization rate	Lower voyage frequency requires careful order aggregation and longer planning horizons

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Client Decision & Implementation

Our client used VesselBot's carrier comparison dashboard to evaluate both scenarios side-by-side, analyzing emissions intensity, schedule requirements, and operational implications.
The client selected Carrier B's service to achieve maximum emissions reduction.

Measured Results

24%

reduction in average emissions intensity:
93.9 ⟶ 71.7g CO2e per TEU km

Ongoing Monitoring: VesselBot's Supply Chain Sustainability Platform continues to track Carrier B's performance in real-time, ensuring sustained efficiency and immediately flagging any service degradation that would require alternative routing.