Tracking and Fleet Optimization of Equipment Chassis for Ocean Transportation

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Summary: This project explores the strategies, methodologies, key metrics and tools for the optimal management of chassis in an extensive multi-depots network. Using an ocean shipping company, we analyze global fleet management as an integrated system embracing tracking capabilities, planning, processes and data analysis. We evaluate the opportunity for a company to invest in a real-time tracking technology, and show that fleet size can be reduced by increasing asset utilization. We also analyze how leasing impacts operations and costs.

KEY INSIGHTS

1. Efficient fleet management starts with mature and accurate tracking system.
2. The fleet size can be reduced by increasing asset utilization. Reducing especially the idle time of chassis (45% of the life cycle is spent empty waiting in ports) is a major source of improvement.
3. Operating costs can be reduced by reducing the porting of leased assets in the fleet.
4. Systematic repositioning flows can be set up thanks to the structural trade imbalance and high concentration of these flows (a few ports account for most of the flows).

Introduction

The structural imbalance in international trade requires ocean shipping companies to reposition empty Reusable Transport Items (RTI) from net importer to net exporter regions. In global open multi-depots network, having visibility over the fleet of RTI is required if companies want to manage flows efficiently. In highly complex logistic networks, the challenge is to get the right equipment to the right place at the right time, in a cost efficient manner and with as small a fleet size as possible. In this project we use the case of an ocean shipping company using high value chassis to handle heavy pieces of cargo. The company recorded losses of trailers. These losses raise the question of the ability to track each asset efficiently to be able to use it again without delay. Beyond the ability to locate assets precisely, tracking also provides increased visibility to manage flows and inventory of empty trailers. Given that the company has accurate tracking data, the next challenge is to increase asset utilization to reduce fleet size. One way to improve asset utilization is to reduce the time each asset is waiting empty (idle) in ports. In addition, the company we studied uses a large fleet of leased assets (as opposed to owned assets). We show in our project how changing the leasing policy can also help to reduce operating costs. The structural imbalance of trade (some regions are net exporters while others are net importers) and concentration of flows is also a major characteristic of the company we studied.
We show how it can use these patterns to set up systematic repositioning moves and increase asset utilization. Understanding this systematic and systemic approach of fleet management, we assess the contribution of tracking technology capabilities to these potential improvements. All these aspects (tracking, appropriate utilization metric, forecast and planning, monitoring system, leasing) need to be considered in an integrated system for an efficient management of RTIs.

**Asset utilization is key in measuring the performance of the fleet**

Defining the appropriate metric with which to evaluate asset performance is key to achieving asset optimization. We used the number of days under six relevant activities as the basic metric to measure asset utilization. Figure 1 presents the actual utilization of trailers over 3 years.

![Graph showing utilization of trailers over 3 years](image)

**Figure 1: Average utilization of the fleet (as a % of total number of days)**

Trailers spend 45% of their life cycle waiting empty in port. This figure reveals opportunities for improvement regarding asset utilization.

In addition, the company has lower visibility over 8% of the fleet used by 3rd parties. Improved tracking capabilities over these assets might help improve asset utilization as well.

**Fleet size and asset utilization relationship**

Asset utilization has a direct impact on the size of the fleet required to handle a given volume of demand. Fleet size is a function of demand and cycle time.

Hence, the speed of moving and repositioning empty RTIs is therefore a key variable in reducing fleet size. Given that 45% of the life cycle is spent empty waiting import, reducing idle time is likely one major way to reduce fleet size. Our simulation showed that reducing idle time in port by 5 days could save 240 trailers. The actual value of the fleet size reduction then depends on the unit value of each asset.

However, there is a threshold beyond which the cycle time cannot be reduced, essentially because of:

- The structural trade imbalance, requiring to reposition empty trailers
- Vessels’ schedules: empties have to wait for the next vessel to be loaded
- Safety stock in each terminal
- Space availability for empties on the vessel: if the next vessel is already full with paying cargo, the empties will have to wait for the next vessel
- Non substitutability of different types of trailers with different sizes (8) and different load capacities (19)

**The leasing policy has an impact on operating costs**

Leasing equipment allows companies to cope with demand variability. We estimated that reducing the portion of leased equipment from 50% to 26% would generate 10% savings on the cost per lift, a lift being the. Not only is leasing more expensive than owning equipment. It also creates additional constraints in the operational management of the fleet, as these assets have to be redelivered to a predefined location at the end of the contract.

**A systematic approach to repositioning through ports and flows segmentation**

The analysis of flows of empty moves from one port to the others reveals that in-flows and out-flows are highly concentrated. Figure 2 represents the cumulative volume of flows of empty trailers.
This concentration suggests that using historical data can help set up systematic repositioning plans, as opposed to repositioning moves based only on actual firm bookings five weeks ahead. These systematic repositioning moves would prevent assets to stay in port empty before they are repositioned to a net exporter port where it will eventually be used for cargo.

How would technology contribute to generating these savings?

There are opportunities for improvement regarding asset utilization, fleet size reduction and leasing policy. Having reliable tracking data available is the first step to fleet optimization. In global and complex network, the ability to track each asset is therefore critical to ensuring that the right equipment is at the right place at the right time. Real time tracking technology, such as GPS, provides the exact location of an asset, eliminating the potential data inaccuracies that can happen in a manual tracking system. However, real time tracking systems do not hold themselves information about the activity or the status of the asset (is it busy or empty?).

Assessing the maturity and accuracy of the existing tracking system is critical to evaluating the opportunity to invest in a new technology, as the marginal cost of the investment relative to expected benefits the new technology could generate is lower if the company also has a reliable tracking system. So the opportunity to invest in a new technology essentially depends on:

- The value of the RTI the company wants to track, which is composed of both values of owned assets and leased assets. In our project, the company wants to be able to recover lost items
- The room for improvement and the marginal additional visibility the technology will be able to bring as opposed to the existing tracking system
- The real value of the investment, bringing the total investment cost to the actual use of the technology.

Figure 3 represents the relationship between the maturity and accuracy of the company’s existing tracking system and the expected benefits from a new, different tracking technology.

Limitations

- The terminals’ physical configuration might limit the efficiency of the technology
- The company needs to have the ability to recover lost or misplaced items
- A new system would provide additional data. This new data alone is useless without the ability to use it. Appropriate KPIs and monitoring tools are a key factor for success in this kind of project. The monitoring system is the necessary bridge to convert pure tracking data into visibility and then to convert improved visibility into operational decisions

Conclusion

The path to operational and financial efficiency starts from extended asset visibility. Planning then plays a
key role as it is key to capture needs dynamically, which is critical in a many to many network of depots, vessels and types of assets. Visibility and advanced planning allow the company to monitor the global and local flows of demand, supply and repositioning; these monitoring tools need appropriate metrics to evaluate the performance of flows. Knowing the exact activity and flows, the company can work on improving the key performance drivers, to finally achieve global efficiency. We see that our initial question concerning asset tracking capabilities is key, as it is a starting point of the path to optimization: without asset tracking and accurate data, the company can make neither tactical nor strategic decisions. But tracking alone is not sufficient to provide business benefits and needs process, monitoring, flows analysis developments to be converted into efficient fleet optimization.