Wagon fleet analysis delivers a healthy return

Freightliner used Navis Rail Analysis to review its operational scenarios, ensuring optimum utilisation of its intermodal wagon fleet and right-sizing future acquisitions.

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Above: Freightliner operates intermodal services moving maritime containers from key UK ports to strategically located inland terminals.

Right: Fig 1. The aim of the exercise was to optimise the composition and deployment of Freightliner's wagon fleet.

One of the ways in which the rail freight sector has been responding to the global economic uncertainty created by the coronavirus pandemic has been to try and reduce operating costs in line with traffic volumes. Allied to this has been a drive to improve the utilisation of capital assets such as carrier-owned rolling stock.

In recent years, many operators have been turning to analytical tools to optimise vehicle deployment. 'Right sizing' the wagon fleet can help to increase average system velocity and the number of loads that each wagon can carry each year.

Many carriers manage their wagons using spreadsheets or generic software, but specialist fleet management and analytical tools can concurrently identify specific wagon requirements as a part of the operating plan. Once calibrated with all of the plan parameters, such as infrastructure, traffic and train schedules, these tools can also be used to forecast and analyse future business requirements.

10

vehicles were cut from Freightliner's planned wagon order

Quantitative analysis allows planners to develop and test multiple options in a reasonable amount of time. This includes the ability to measure outcomes by costing various scenarios to understand any trade-offs. The planners have the flexibility to rapidly test an outcome when an input is changed — such as projected traffic volume or asset availability.

Assessing requirements

In 2019 the Freightliner subsidiary of Genesee & Wyoming Inc contracted Australian company Biarri Rail to develop the processes needed to analyse future wagon requirements. The UK intermodal operator was planning to acquire new wagons to support projected increases in demand for its maritime container business, and wanted to analyse various options to inform its strategic decision-making.

Biarri Rail had developed a suite of analytical tools that had been used by freight rail operators as far apart as Australia and the USA. Biarri was subsequently acquired by Navis to expand its software offerings to include intermodal planning and operations, leading to the establishment of Navis Rail in March 2020.

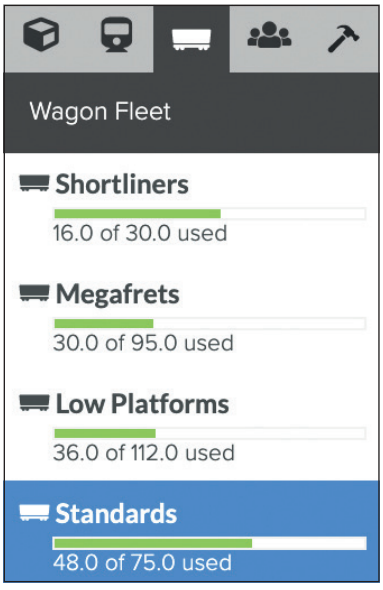
Freightliner's intermodal wagon fleet includes a mix of vehicle sizes and types (Fig 1). The KTA, IKA and FLA wagons, for example, can carry different configurations of 20, 30, and 40 ft containers, while the twin-platform Shortliner was specifically designed to maximise the number of 40 ft containers in any given train length. The objective of the analysis was to determine the right mix of wagons to inform the procurement exercise. This evaluation would be based on train makeup, traffic forecasts, network and terminal configuration, and the turnaround times at the yards. The aim was to maximise the amount of freight that could be carried with the minimum number of wagons.

The Navis Rail team spent several days with Freightliner staff in London and at its Ferrybridge depot in Yorkshire, reviewing the company's existing processes for planning and scheduling trains, locomotives, wagons and crew across the three core businesses (Intermodal, Bulk and Network Rail infrastructure work).

Leading the project were Matt Herbert, Navis Rail's Senior Manager for Field Operations, and Research Engineer Sam Thompson. The Freightliner team included European Engineering Director Tim Shakerley and Jon Bunyan, General Manager, UK Operations Projects.

Calibrating the model

The baseline Freightliner wagon plan was based on a sophisticated Excel spreadsheet (Fig 2). This had been customised to model connecting train services and track occupation at each terminal, to ensure there was sufficient terminal capacity and turnaround times. Its primary drawback for further analysis was the difficulty in re-setting the parameters to allow new scenarios to be run quickly. The manual processes could also be prone to errors without meticulous verification, which further slowed the process.



To start the project, internally validated Freightliner data was uploaded to the Navis Rail planning platform. This included train schedules, wagon inventory, terminal data and wagon movements. The idea was to establish a new baseline wagon plan which would allow rapid changes to parameters and business rules to produce new scenarios.

Visualisation tools allowed the teams to review discrepancies between the new fleet size calculations and Freightliner's baseline spreadsheet. For example, high wagon counts were in some cases being sustained at specific yards for too long. Using this type of feedback, the analysts were able to fine tune the train and yard capacities, as well as testing additional assumptions and/or business rules that needed to be represented.

To complete the calibration, the analysts iterated the process until the calculated fleet sizes in the two models matched. This allowed them to confirm that all of Freightliner's business rules and assumptions had been modelled correctly.

Running the scenarios

Freightliner then described a range of alternative scenarios, which were refined and iterated by the Navis Rail team. The primary levers were changes to yard capacities, turnaround times, and train lengths. The results provided the project team with the basis to test and question the assumptions that had initially been used.

The graphical user interface (Fig 3) enabled the analysts to identify potential small changes in train timings that would significantly improve wagon utilisation. By the end of the analysis, Navis Rail had been able to create multiple projections of the number and types of wagons needed in future scenarios and to plan the balancing of empty wagon movements. At this point, the analysts were able to present their fleet size and type calculations, so that additional scenarios could be run to validate the results.

Throughout the project, the Navis Rail team was able to provide Freightliner with rapid feedback about alternative wagon configurations and quantify the fleet sizes for the various inputs. They were also able to forecast lower capital costs by suggesting the deployment of shorter wagons and increasing train lengths to the maximum permitted by network and yard limits.

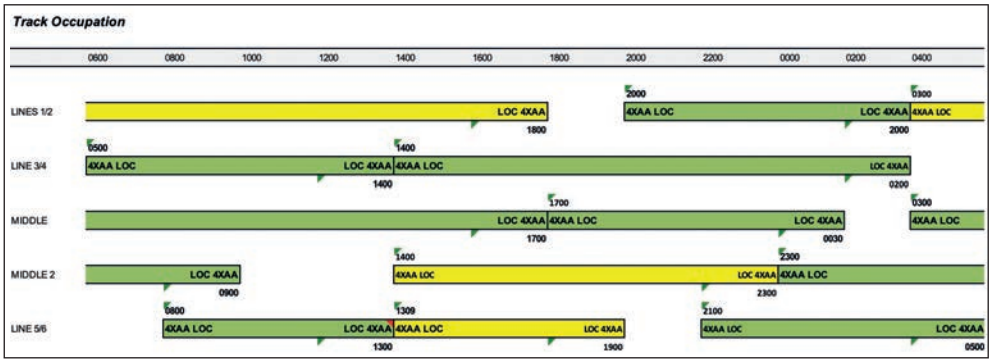


Fig 2. The Freightliner spreadsheet had been customised to model connecting train services and track occupation at each terminal, to ensure there was sufficient terminal capacity and turnaround times for train services.

Project results

The project successfully demonstrated that the composition of wagon types could be modified to increase capacity without affecting overall fleet size. Freightliner would be able to reduce its capital spending on new wagons, which also helped to keep wagon maintenance costs to a minimum. Optimising the fleet composition could potentially enable further streamlining of terminal operations, while contributing to improved customer satisfaction.

By evaluating requested variations in terminal turnaround times, the analysis confirmed that the fleet size could be further reduced if these were operationally feasible. Some scenarios were also run to test changes to train services, such as removing pairs of trains from the timetable; this also offered a potential reduction in the number of additional wagons required.

The final analysis identified errors in the original baseline spreadsheets that allowed the order to be reduced by 10 vehicles, greatly improving the return on investment.

Strategic decision support

This algorithmic-supported analysis enabled Freightliner to make better-informed strategic decisions. However, the Navis Rail software can also support the optimisation of other issues such as the planning of train services, yard operations and crew rostering.

Integrated planning systems offer multiple benefits, including:

- automatic generation of wagon fleet requirements, based on network data and the operating plan (traffic, blocks, train schedules, etc);
- analysing limits on wagon fleets as an input to support the integrated planning process, rather than as a post plan review;
- gaining immediate feedback for sales and marketing teams on the impact of new business on the availability of wagon types;
- using traffic forecasts to optimise train scheduling and makeup, yard capacities and future vehicle requirements;
- negotiating more efficient train paths with infrastructure managers or other network providers.

Having the ability to generate and cost plans to meet alternative patterns of customer demand can help operators to evaluate new business opportunities rapidly. This is potentially valuable in the current climate, where traffic volumes look set to remain inconsistent for an indefinite period, due to the fallout from the pandemic. Integrated planning software and skilled analysis can produce actionable results and help operators to mitigate unknowns in the wider economic and political environment.

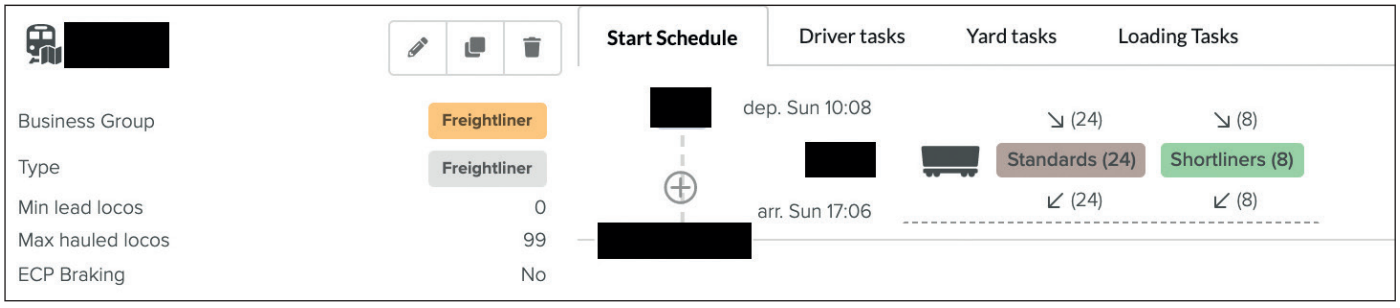


Fig 3. The Navis Rail graphical user interface gave analysts the tools to make small changes and rapidly test a variety of scenarios.