Standardizing and Automating Yard Capacity Estimation

Luke Haskins, Team Leader; Thatcher Hagen; Mackenzie Johnston; Javier Muriel Coscio; Nathan Shipp
Industry Partners: Bradley Taylor, Engineer II; Chad Treadaway, Senior Manager – Engineering; Conner Oxford, Engineer I
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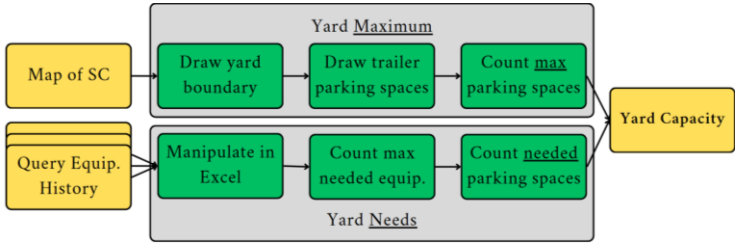
Current Yard Capacity Process

ABF Freight, a subsidiary of ArcBest, is a leading North American less-than-truckload carrier headquartered in Fort Smith, Arkansas. ABF operates 242 service centers across the U.S., Canada, and Puerto Rico, and generates annual revenue exceeding $5 billion. ABF currently estimates yard capacity using trailer-equivalent parking spaces, but the process is labor-intensive, unstandardized, and difficult to scale. While the underlying method will remain the same, they have asked us to improve the process by making it more consistent, scalable, and easier to use through automation and visualization. This will streamline operations and enhance accuracy across all service centers.



Project Design Objectives

Our objective was to help ABF Freight consistently estimate yard capacity and improve visibility across all service centers through an automated and scalable approach. We aimed to replace their manual, inconsistent process with standardized methods for calculating yard maximums and yard needs. The final goal was to provide tools that would support proactive planning, reduce the risk of backlogs, and improve visibility into how equipment is distributed across the network.

Requirements

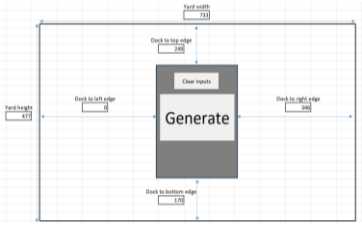
- ☐ Create a visualization tool to see all SC yard capacities simultaneously
- ☐ Be able to see historical information related to yard capacity on a per-SC basis
- ☐ Standardize the yard maximum estimation process
- ☐ Reduce manual labor required for yard maximum estimation process
- ☐ Automate yard needs calculations for all SCs at once

Preferences

- ☐ Automate the yard maximum estimation process
- ☐ Create the visualization tool and historical information page in Power BI

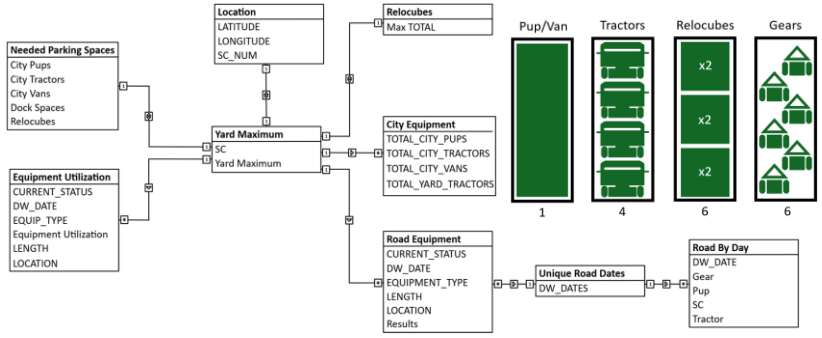
Estimating Yard Maximums

We began by grouping all SCs into three categories by yard shape: perfect rectangular, imperfect rectangular, and irregular. Then, we developed a different estimation process for each category, so that we could maintain accurate, specialized estimates across all yard types. Finally, we developed a calculator in Excel VBA capable of automatically performing all three yard maximum estimation processes and superimposing the results over real images of each SC.



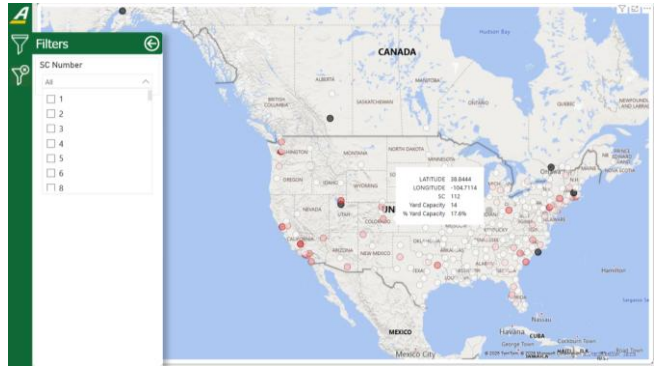
Calculating Yard Needs

We expanded the OSE team's existing database queries to collect historical equipment inventory data for every location. Using Power BI, we automated these calculations to estimate the number of trailer equivalent parking spaces required at every service center on any given day. These yard needs estimates were then combined with the yard maximum data to produce actionable capacity metrics, which were integrated into the broader yard capacity tool.



Custom Visualization Tool

We connected the output sheet from the yard maximum Excel file to the Power BI report for yard needs to enable the visualization of yard capacity across all service centers simultaneously. On the first page of the report, we created a map that displays yard capacity using color coding. Service centers with low capacity appear in red, while others appear in white. This allows for quick visual identification of locations that require attention, without overwhelming the user with data.



On the second page of the Power BI report, we designed two time series visuals that give more information about any critical service centers (identified from the map). The first chart displays yard capacity over time for any selected service center, while the second shows equipment utilization over time based on daily equipment status.