

SIMULATION-BASED CAPACITY PLANNING FOR FLEET GROWTH AT PENSKE TRUCK LEASING

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ABSTRACT

This case study examines how Penske Truck Leasing utilized Simio simulation software to address capacity planning challenges associated with fleet growth. Facing the addition of 500 vehicles over five years to an already space-constrained facility, Penske's Operational Excellence team developed a comprehensive simulation model to identify capacity constraints and evaluate potential solutions. The model analyzed multiple capacity dimensions including parking space, service bays, technician staffing, and support resources. Through simulation, Penske identified specific capacity ceilings, determined optimal timing for implementing various solutions, and provided facility managers with a data-driven roadmap for supporting growth while maintaining operational efficiency.

1 INTRODUCTION

Penske Truck Leasing operates as part of Penske Transportation Solutions, managing a fleet of more than 414,000 vehicles across North America. The company's operations span multiple service areas including truck rental, leasing, maintenance services, and used vehicle sales, supported by nearly 1,000 service facilities and over 11,000 maintenance technicians.

In 2020, Penske's Operational Excellence department identified a significant challenge: a facility manager needed to accommodate 500 additional vehicles over five years while already operating at perceived maximum capacity. This growth plan, adding 100 vehicles annually, threatened to overwhelm existing resources and potentially compromise service quality.

2 PROBLEM STATEMENT

The capacity challenge extended beyond simple space limitations. As Morgan Mistysyn from Penske's Operational Excellence team explained, "Capacity in its simplest form is pretty straightforward. It's the number of workspaces you have multiplied by how many people and hours you have to operate them, divided by the throughput time of the unit moving through the system." However, the reality was far more complex.

Adding 500 vehicles created cascading pressures across multiple dimensions:

- 1. Physical Space Constraints:** The facility's parking lot and service bays were already fully utilized
- 2. Resource Requirements:** Each additional vehicle required parts, tires, fluids, and storage space
- 3. Staffing Implications:** More vehicles necessitated additional technicians and support facilities
- 4. Operational Complexity:** Different vehicle types had vastly different maintenance frequencies

Traditional analytical methods proved insufficient for modeling these complex, interrelated factors.

3 METHODOLOGY

Penske's Operational Excellence team selected Simio simulation software to model the facility's operations and test potential solutions. The simulation approach offered several advantages over traditional planning methods:

1. **Model Development:** The team documented current processes and created detailed process maps, working with stakeholders to ensure accurate representation of operations
2. **Data Collection:** The team gathered historical operational data, conducted time studies, and incorporated subject matter expert input
3. **Model Validation:** The team verified that the model operated as intended and validated its accuracy against observed real-world outcomes
4. **Solution Testing:** Multiple potential solutions were incorporated using Boolean controls to test combinations of approaches
5. **Visualization:** A 3D rendering of the facility visually represented simulation results, making complex data accessible to decision-makers.

4 RESULTS

The simulation model successfully identified when specific capacity constraints would be encountered and recommended optimal solutions:

- **Parking Capacity:** The model determined exactly when parking capacity would be exceeded and evaluated solutions including routing work to other facilities, adding parking spaces, implementing mobile maintenance units, and optimizing scheduling
- **Bay Utilization:** The simulation identified when service bay capacity would become a constraint and evaluated options including adding new bays, creating external service areas, and implementing specialized technician roles
- **Technician Staffing:** The model determined optimal timing for adding technicians and explored creative staffing approaches including additional shifts and specialized roles

For each potential solution, the model assessed implementation timing requirements, cost implications, impact on customer satisfaction, safety considerations, and effectiveness in addressing capacity constraints.

5 CONCLUSION

Penske's application of Simio simulation software to capacity planning demonstrates the significant value of simulation-based decision making in complex operational environments. The approach allowed Penske to reduce risk, optimize timing, enhance understanding, and support strategic planning.

While the simulation provided valuable insights, Penske recognized its limitations as a statistical estimate rather than a perfect prediction. Consequently, Penske integrated simulation results with other testing methodologies to account for behavioral aspects that simulation cannot capture.

The success of this project has led Penske to expand its use of simulation to other areas, including rental operations, logistics, and call center staffing.