



Phantom Fireworks - Project Boom

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Meet the Team



Dawson Prough



Frank Meeteer



Chloe Feast



Michaela Chew





Phantom Fireworks

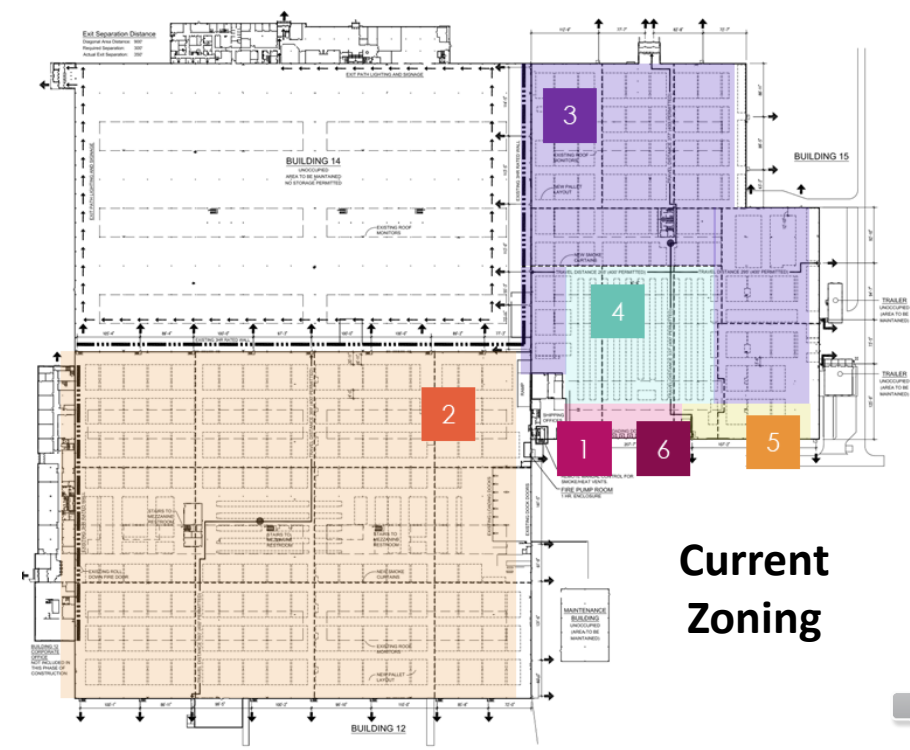
Background: Phantom Fireworks is a \$200M consumer-based retail firework company with a peak season from mid-June to shortly after the Fourth of July. All products are shipped from China to their 750,000 ft² Warren, Ohio warehouse for distribution across their network.

Problem Statement

During the 2020 peak summer season, Phantom experienced a “**process breakdown**” in the Warren warehouse where product was not restocked into the pick area and labor was not staffed to meet demand in the warehouse.



With their volume expected to grow in the upcoming years, Phantom would like to examine **facility layout & material flow** and **forecasting & staffing** in the warehouse to reduce the risk of process breakdown in the future and improve ability to meet demand requirements.



Current Zoning





Facility Layout: Current State & Alternatives

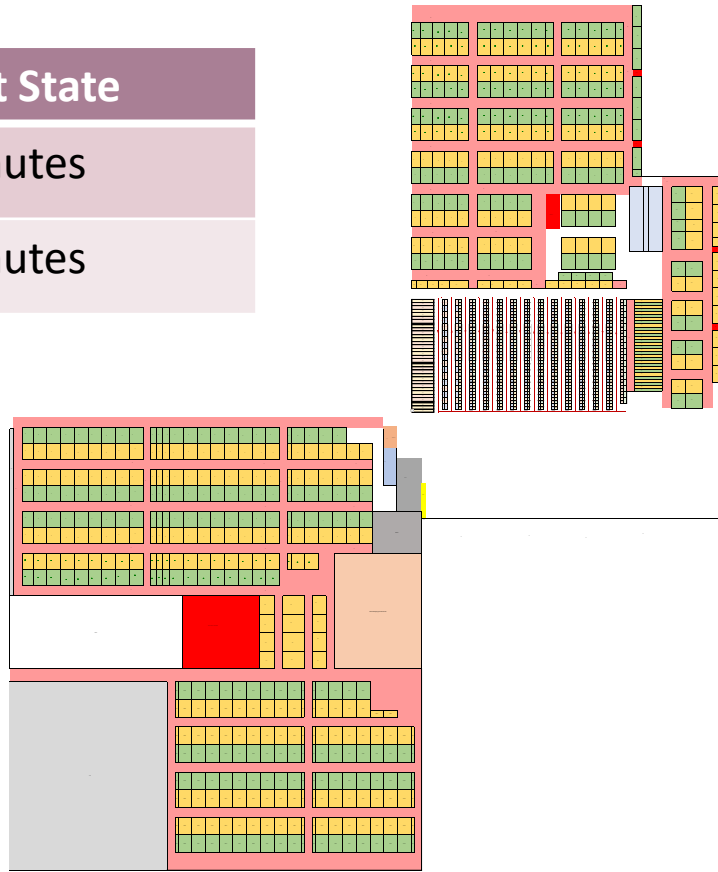
Current State

Metric	Current State
Pallet Order Pick Time	9.6 minutes
Pick Bin Replenishment Time	5.2 minutes

Pain Points

Random Placement of Items in Bulk/Overflow Bin Slots

Excess Material Handling



Alternatives

Optimized placement of items in pick bins by selection order

Optimized placement of items in Restock zones by item frequency

Picking Two Pallets at a Time





Facility Layout: Methodology

Modeling:

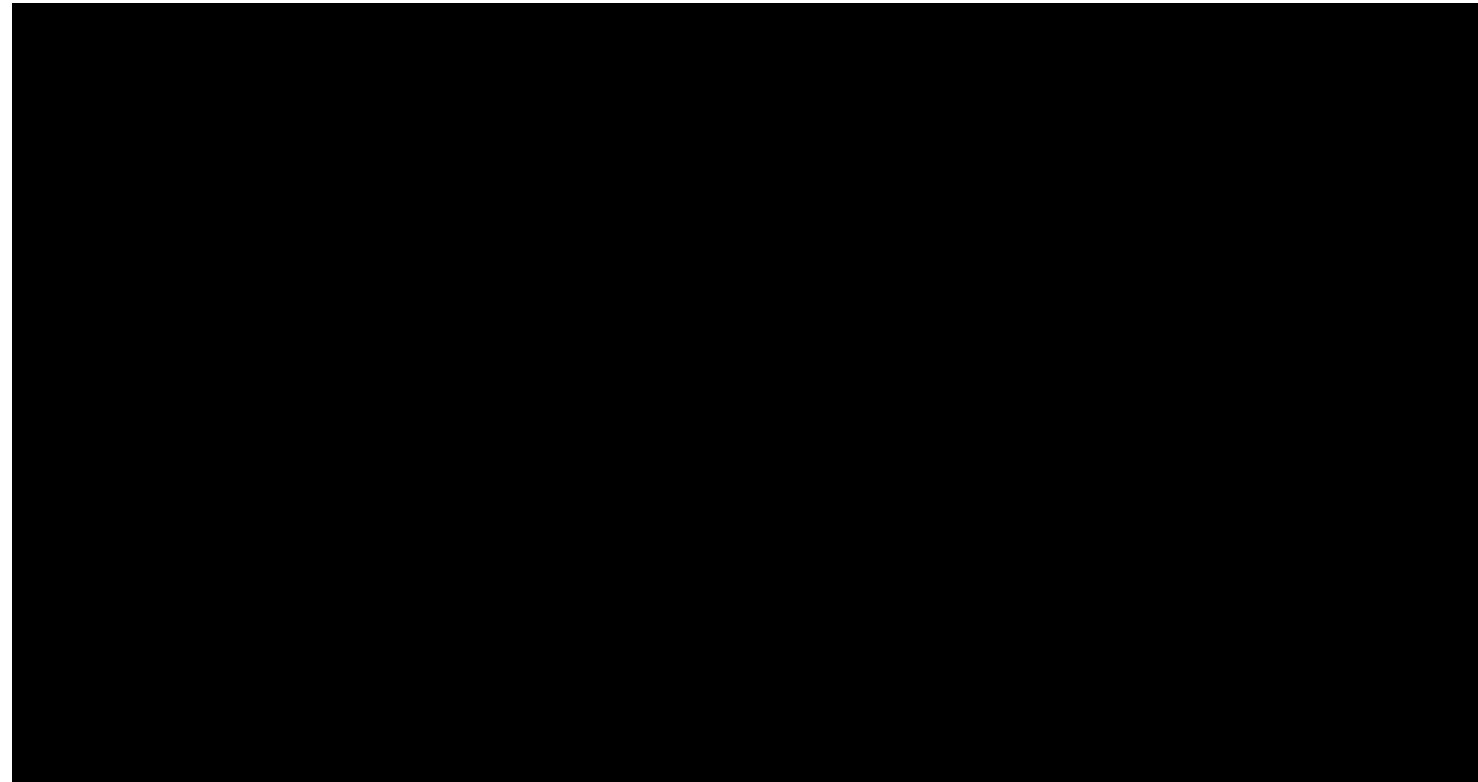
Simulated picking and restocking processes in to-scale model of warehouse in Simio

Model Inputs

- ▶ Pallet arrival time and case picking order
- ▶ Employee work schedules
- ▶ Item mapping in pick and restock areas

Model Outputs

- ▶ Order Picking Time
- ▶ Replenishment Request Fulfillment Time



Facility Layout: Results



Alternative	% Reduction in Pick Time*	% Reduction in Restock Time*
Pick two pallets at once	13.34%	0%
Restock Sectors	0%	5.43%
Change Item-Pick Bin Mapping	1.65%	2.08%

*Statistically significant (p<0.025)

- ▶ PROJECTED IMPROVEMENTS: **14.99%** reduction in pick time, **7.51%** reduction in restock time





Forecasting & Staffing - Methodology



- ▶ Processed past data
- ▶ We cannot directly observe warehouse operations at peak times
- ▶ Average pallet time
- ▶ Average pallet/picker/day
- ▶ Observed Trend
- ▶ Cases/Hr
- ▶ Used past 3 years data
- ▶ Seasonalized data
- ▶ Exponential Smoothing
- ▶ Centered Moving Average
- ▶ Projected # of Pallets
- ▶ # of pickers needed
- ▶ Estimated # of Shifts
- ▶ Time to begin training





Thank you!

