Kitting Facility Supply Chain Analysis and Refrigerated Freight Prediction

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Background

Talking Rain is a fast-growing beverage company known for their popular brand Sparkling Ice.

Generalized Question

How could Talking Rain reduce cost in their supply chain?

1) By scheduling fewer unnecessary refrigeration trucks
2) With the implementation of a centralized kitting system

Constraints

- Shipment routes between facilities are estimated
- Limited historical weather forecasts
- No exact addresses for suppliers and co-packers
- 44,500 lb capacity for trucks
- FMCSA regulations for truck driver work schedule

Goals / KPIs

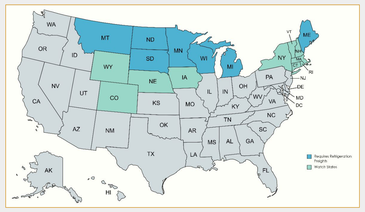
- Cut transportation costs by scheduling fewer refrigerated trucks
- Find optimal kitting facility location
- Reduce transportation costs
- Utilization of kitting facility < 80%

ISE Skills

Simio, FICO, R, python

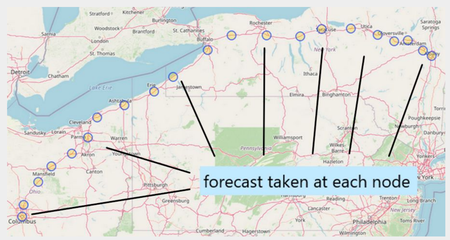
Weather Prediction

Current Refrigeration SOP



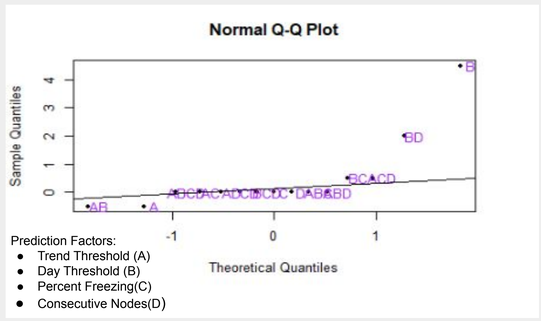
Refrigeration trucks are ordered for routes through at-risk states from November to March.

Proposed System



Python script predicts freight type for route.

Factorial Analysis

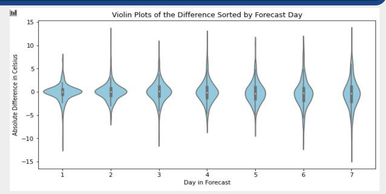


Prediction Factors:

- Trend Threshold (A)
- Day Threshold (B)
- Percent Freezing(C)
- Consecutive Nodes(D)

Allows Talking Rain to adjust strictness of prediction.

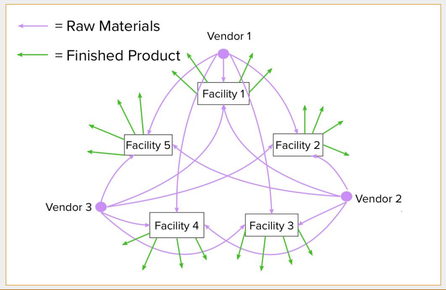
Historical Forecast Analysis



Historical forecasts used to implement temperature buffers to prevent frozen product.

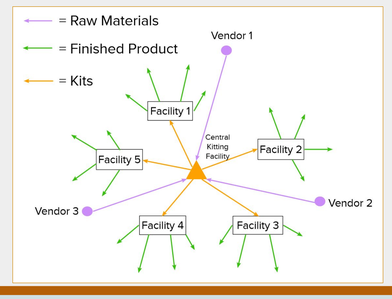
Current Supply Chain

All production facilities receive raw materials and produce their own products from start to finish.



Future Kitting Supply Chain

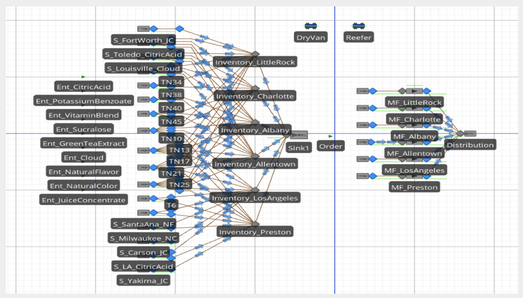
Kitting facility receives raw materials and creates kits. Production facilities use kits to produce finished product.



Optimization Model

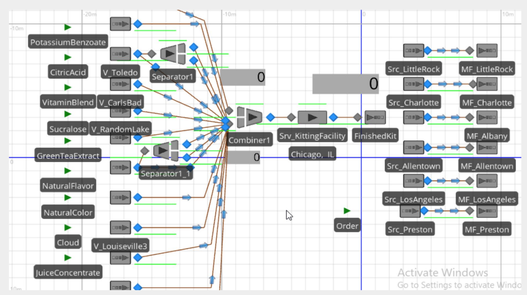
- Finds optimal city to locate kitting facility to minimize total transportation cost
  - Accounts for variable price between dry van and refrigerated freight
  - Picks one supplier for each ingredient with the exception of juice concentrate
  - Model scalable via Google's Directions API

Current System Model

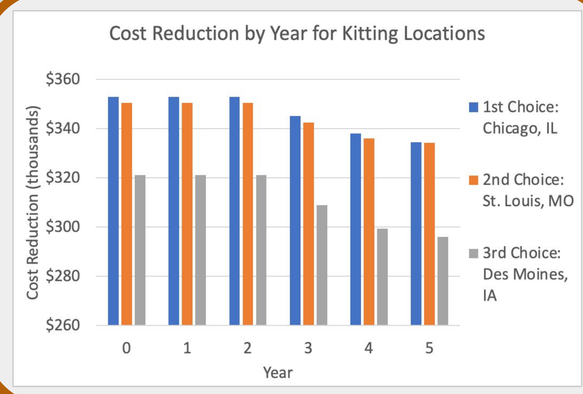


- Calculates cost and lead time for ingredient transportation
- Demand scales up by 10% per year

Kitting System Model



- Tracks annual transportation cost considering seasonality
- Validates utilization of kitting facility



Results

Freight Prediction Savings:
2019-2021: **~$250k**
TR Demand Goal (80 mil. bottles): **~$960k**

Optimal City Location: **Chicago, IL**
Kitting Facility 5-Year Savings: **~$2MM**

Special Thanks

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