Project

Introduction to Math Programming OPER 510

BLUF: Min Transport problem of DinoBalls from production facs to retail stores

Focus: Challenge yourself, learn, teamwork, grade

Scenario Outline:

* 3 Production facilities
* 8 Retail stores
* 3 Production lines per store
* Each facility produces ⅓ total DinoBalls
* Each production line caries equal wear-tear: up to 160 hrs/week
* Trucking expense is cost plus 20% premium

“What if?” Problem 1: Remove constraint that each production facility produces ⅓ DinoBalls

“What if?” Problem 2: Determine reserve price of retrofitting 2 FastProd lines at 1, 2, or 3 production facilities. MCS can sell of existing assembly lines.

“What if?” Problem 3: Goal: (i) Minimize Cost (ii) Minimize Emissions. Do they conflict?

* Pareto frontier for cost goal
* Pareto frontier for emission goal
* Weighted formula for combined goal

Grading

* Report: 80 pts
  + 5pts: Overall organization and clarity
  + 10 pts: Explanation and rationalization of model assumptions
  + 20 pts: Correctness and explanation of base case
  + 15 pts: Correctness and explanation of “what if?” problem #1
  + 15 pts: Correctness and explanation of “what if?” problem #2
  + 15 pts: Correctness and explanation of “what if?” problem #3
* Presentation: 20 pts
  + 5 pts: Overall organization and clarity
  + 6 pts: Base case
  + 3 pts: “what if?” problem #1
  + 3 pts: “what if?” problem #2
  + 3 pts: “what if?” problem #3

Base Case Model

1. Decision Variables
   * Quantity of DinoBalls shipped
   * Quantity trucks used each route each month *N*
   * Build FastProd at factory i
2. Other Sets
   * : Shipping rate for route
   * : Gas used each truck for a route
   * : Hourly energy cost each production facility (with or w/o FastProd)
   * : Demand of DinoBalls at each retail store each month
   * : Pollution (emissions) produced at each factory (with or w/o FastProd)
   * *i* : Production facility of origin
   * *j : Retail store of destination*
   * *k : Month of activity*
   * *l : with FastProd = 1, w/o FastProd = 2*
3. Objective Function

Minimize

Cost of transporting weight:

+Cost of truck trips:

+Cost of production:

+[upgrades]

1. Constraints
2. Demand
3. Each facility produces ⅓ DinoBalls
   * For each month k:
4. Equal wear/tear each line
   * Constraint will be built into the set defining productivity of each facility
5. Each line runs up to 160 hrs/month
6. Can only send 250 units per truck
   * Please proof this list for missing constraints
7. Outputs of Model
   * , Minimum feasible solution for cost of transport
   * Quantity of DinoBalls shipped
   * Quantity trucks used each route each month
   * Productivity of each production facility
   * Hours of operation of each production facility
   * Incorporate Stephen’s suggestion for reporting model outputs
8. Competing objective
   * Minimize emissions

Way Ahead

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| Suspense | Task | Lead |
| 15 Nov | Transcribe model | Marc |
| 16 Nov | Working model | Marc (team effort) |
| 20 Nov | “What if” problem formulation | Stephen |
| 21 Nov | Report outline | Ryan |
| 21 Nov | Presentation outline | Courtney |
| 26 Nov | Format model outputs | Daniel |
| 27 Nov | Meet w/ Dr.Cox in office for feedback 9-11 AM | Ryan (entire team attends) |
| 28 Nov | Final adjustments to model | Marc (entire team helps) |
| 28 Nov | Final touches to report | Ryan |
| 29 Nov | Practice Presentation | Courtney (entire team attends) |
| 30 Nov | Team Presents | Courtney |
| **Always** | **Winning** | **Entire Team** |