Remarks on the Capacitated Plant

Location Model

Demand side constraint

\[
\text{Supply: } \frac{1}{2} \quad \text{plant } 1 \quad \frac{X_{ij}}{\text{region } j} \quad \text{plant } 2 \quad \frac{X_{2j}}{\text{Annual}} \quad \text{plant } n \quad \frac{X_{nj}}{\text{Demand } D_j}
\]

\[
\text{Demand side constraint: } \quad X_{ij} + X_{2j} + \ldots + X_{nj} \geq D_j \quad (j = 1, 2, \ldots, m)
\]

\# of demand regions
Supply side constraint

Supply: plant $i$

Demand

capacity

$K_i$

\[ \sum_{i=1}^{m} X_{im} \geq X_{i1} + X_{i2} + \ldots + X_{im} \]

\(i = 1, 2, \ldots, n\)

\# of plants

"On-off" constraint

$X_i = 0$ (no plant)

$X_i = 1$ (plant)

$X_i \in (0, 1)$
Objective:

Minimize Total Cost $C$

\[ C = \text{"fixed cost"} + \text{"supply costs"} \]

(see last class for details)

\[ C = \sum_{i=1}^{n} f_i x_i + \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} c_{ij} \]

Note on double-summation

Example: $m = 3$, $n = 4$

\[ \sum_{i=1}^{4} \left[ \sum_{j=1}^{3} x_{ij} c_{ij} \right] \]

\[ = \sum_{i=1}^{4} \left( x_{i1} c_{i1} + x_{i2} c_{i2} + x_{i3} c_{i3} \right) \]

\[ = \sum_{i=1}^{4} x_{i1} c_{i1} + \sum_{i=1}^{4} x_{i2} c_{i2} + \sum_{i=1}^{4} x_{i3} c_{i3} \]

Result: 12 terms
Back to our process

**Phase III**: Determine the actual location of each facility using a **GRAVITY LOCATION** model

(Refer to the text for details)

**Phase IV**: Optimize the entire (total) supply chain network

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![Diagram of supply chain network with symbols for suppliers, manufacturing, warehouses, and customers]
The above problem is "just" a larger version of the problem addressed in Phase II (i.e., the Capacitated Plant Location Model).
ISM 125/225, LECTURE #17 (3/2/10)

Agenda:

1. Complete Process for Facilities Design (see above)

2. HW # 6

3. Project

4. Thursday's lecture
HW #6

Prob 2: Sun-Oil

Do in 2 steps

(1) Low capacity plants only

(2) Low & High capacity plant

Prob 3: Dry-Ice

This is the problem that we have already set up (when we did the Capacitated Plant Location model)

Do in 2 steps

(1) Low capacity plants only

(2) Low & High capacity plants
Course Feedback:

- 5% → outstanding (A+)
- 10% → excellent (A)
- 20% → fine (A-)
- 40% → very good (B+)
- 20% → good (B)

Learning

Hard work → high quality work → good grades

Project, Exams, Lectures, HW

Team, Instructor, student

Feedback

People & Technology

Current process
- People
- Process
- Technology

(includes:
- structured problem-solving
- personality traits
  - courage
  - confidence
  - motivation
- structure vs ad-hoc

- transparency

- Cancel Thursday's class
- I will record a lecture (with virtual students) EMN, VIEW
- You can watch this lecture off the Internet (Go to the ISM 125/225 website for details)
- HW Set #7 will be on the class website
- Instructions for turning in HW #6 will be on the class website