A Proposal of Optimizing Capacity Planning for Mapleleaf

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After examining models in several different scenarios, I propose to construct a new plant in Guadalajara next year to meet the growing demand. Only when all four current factories operate in full capacity could the 5-year demand be satisfied without additional plant (Scenario 1 in Appendix I). However, it's highly unlikely since those facilities are so old and inefficient that no more than 90% capacity is achieved. When the calculation is based on 90% capacity run by four factories (Scenario 2), no feasible solution exist since total supply capacity fall short of the demand. The supply shortage could occur earlier than thought, in third or fourth year instead, if the demand would increase by 5% to 6% year-to-year as per forecast report (Exhibit 1 in Appendix II). It's imperative to begin next year since it takes two years to prepare new plant. More important, the cost saving is substantial, about $6.2 Million yearly ($20,687 daily X 300days), for the new plant to be opened in Guadalajara. Since investment environment in Guadalajara is stable with modern infrastructure and skilled labor pool, Mapleleaf should take action to set up the production facility there to better serve local market with the largest increase in demand.

Furthermore, I suggest shut down the factory in Kansas City because it has highest production cost, lowest capacity and the least increase in demand locally. When Guadalajara plant comes to picture while other factories run in full capacity (Scenario 3) or 90% capacity (Scenario 4), the optimal solutions identically result that no production is required in Kansas City factory any more for minimizing cost purpose. 750 cartons daily needs could be easily covered by Los Angeles factory, or part by newly planned Guadalajara factory if current factories operate at 90% capacity level. Someone may argue that closing Kansas City plant is not farseeing since the demand in tenth year will outstrip the total capacity all factories combined including the one in Guadalajara (Scenario 5 & Scenario 6). Nevertheless, Mapleleaf could expand the capacity of Guadalajara plant at that time or open another there if everything is running well. It's noticeable that the production cost of one carton manufactured in Guadalajara plus the distribution cost to Kansas City is 33.75% less than that made in Kansas City (Exhibit 2 & 3). It's not rational to keep the factory without economic scale in a long-term strategy. The resource even could be better allocated to upgrade Los Angeles factory to increase capacity or reduce production cost.

In sum, it's at the company's best interest to invest factory in Guadalajara to meet 5-year and 10-year demand with minimum cost.

Appendix:

Scenario 1

Run Full Capacity in current facilities WITHOUT Guadalajara Factory for the Fifth Year Demand

```
Status: Optimal
The minimum total cost is: $164562.5
```

DC ⟍ Plant	Toronto	Kansas City	Los Angeles	Seattle	Chicago	Atlanta	Guadalajara
Toronto	1000	0	0	0	1500	0	0
Kansas City	0	750	0	0	0	750	0
Los Angeles	0	0	1500	0	0	0	2000
Seattle	0	0	1000	1500	0	0	0

(unit: cartons/day)

Scenario 2

Run 90% Capacity in current facilities WITHOUT Guadalajara Factory for the Fifth Year Demand

```
Status: Infeasible
The minimum total cost is: $168875.0
```

DC ⟍ Plant	Toronto	Kansas City	Los Angeles	Seattle	Chicago	Atlanta	Guadalajara
Toronto	1000	0	0	0	1250	0	0
Kansas City	0	750	0	0	250	750	600
Los Angeles	0	0	1750	0	0	0	1400
Seattle	0	0	750	1500	0	0	0

Violate one capacity constraint <=1350

(unit: cartons/day)

Scenario 3

Run full Capacity in current facilities WITH Guadalajara Factory for the Fifth Year Demand

```
Status: Optimal
The minimum total cost is: $143875.0
Whether to open Guadalajara factory: 1
(1=Open; 0=Not Open)
```

Plant \ DC	Toronto	Kansas City	Los Angeles	Seattle	Chicago	Atlanta	Guadalajara
Toronto	1000	0	0	0	1500	0	0
Kansas City	0	0	0	0	0	0	0
Los Angeles	0	750	2500	0	0	250	0
Seattle	0	0	0	0	0	0	0
Guadalajara	0	0	0	1500	0	500	2000

(unit: cartons/day)

Scenario 4

Run 90% Capacity in current facilities WITH Guadalajara Factory for the Fifth Year Demand

```
Status: Optimal
The minimum total cost is: $145737.5
Whether to open Guadalajara factory: 1
(1=Open; 0=Not Open)
```

Plant \ DC	Toronto	Kansas City	Los Angeles	Seattle	Chicago	Atlanta	Guadalajara
Toronto	1000	0	0	0	1250	0	0
Kansas City	0	0	0	0	0	0	0
Los Angeles	0	650	2500	0	0	0	0
Seattle	0	0	0	600	0	0	0
Guadalajara	0	100	0	900	250	750	2000

(unit: cartons/day)

Scenario 5

Run full Capacity in current facilities WITH Guadalajara Factory for the Tenth Year Demand

```
Status: Optimal
The minimum total cost is: $196500.0
Whether to open Guadalajara factory: 1
(1=Open; 0=Not Open)
```

DC / Plant	Toronto	Kansas City	Los Angeles	Seattle	Chicago	Atlanta	Guadalajara
Toronto	1000	0	0	0	1500	0	0
Kansas City	0	500	0	0	0	0	0
Los Angeles	0	500	3000	0	0	0	0
Seattle	0	0	0	2000	500	0	0
Guadalajara	0	0	0	0	0	1000	3000

(unit: cartons/day)

Scenario 6

Run 90% Capacity in current facilities WITH Guadalajara Factory for the Tenth Year Demand

```
Status: Optimal
The minimum total cost is: $199575.0
Whether to open Guadalajara factory: 1
(1=Open; 0=Not Open)
```

DC / Plant	Toronto	Kansas City	Los Angeles	Seattle	Chicago	Atlanta	Guadalajara
Toronto	1000	0	0	0	1250	0	0
Kansas City	0	850	0	0	500	0	0
Los Angeles	0	150	3000	0	0	0	0
Seattle	0	0	0	2000	250	0	0
Guadalajara	0	0	0	0	0	1000	3000

(unit: cartons/day)

Appendix II

Exhibit 1

FORECASTED DEMAND OVER THE NEXT 10 YEARS
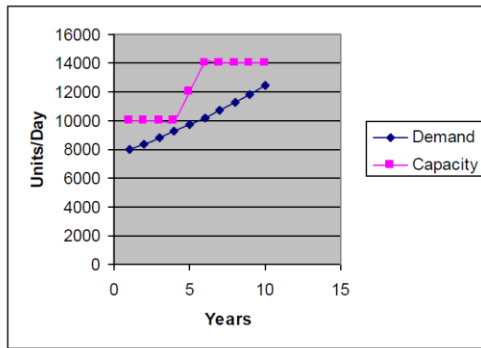
Exhibit 2

PRODUCTION COSTS AND CAPACITIES

Facility	Production Cost per Carton	Daily Capacity per Carton
Toronto	$14	2,500
Kansas City	$19	1,500
Los Angeles	$13	3,500
Seattle	$17	2,500

Exhibit 3

PRODUCT DISTRIBUTION COSTS AND 5- AND 10-YEAR DEMAND (DAILY CARTONS)

Centers	Production Facilities					Forecast	
	Toronto	K.C.	L.A.	Seattle	Guadalajara	5-Yr.	10-Yr.
Toronto	0.75	2.50	4.50	4.75	5.25	1000	1000
K.C.	2.50	1.00	2.50	2.75	3.25	750	1000
L.A.	4.50	2.50	0.50	2.25	1.75	2500	3000
Seattle	4.75	2.75	2.25	0.75	2.50	1500	2000
Chicago	1.50	1.50	3.75	2.50	3.75	1500	2000
Atlanta	3.00	2.25	3.00	3.50	3.50	750	1000
Guadalajara	5.25	3.25	1.75	3.75	0.50	2000	3000

Reference:

O.Hall,Jr. & C. McPeak (2008). Designing Optimal Capacity Planning Strategies. Ivey ID:9B08D033. London, Canada: Ivey Publishing