DISTRIBUTION SYSTEM DESIGN

The Darby Company manufactures and distributes meters used to measure electric power consumption. The company started with a small production plant in EI Paso and gradually built a customer base throughout Texas. A distribution center was established in Ft. Worth, Texas, and later, as business expanded to the north, a second distribution center was established in Santa Fe, New Mexico.

The EI Paso plant was expanded when the company began marketing its meters in Arizona, California, Nevada, and Utah. With the growth of the West Coast business, the Darby Company opened a third distribution center in Las Vegas and just two years ago opened a second production plant in San Bernardino, California.

Manufacturing costs differ between the company's production plants. The cost of each meter produced at the EI Paso plant is $10.50. The San Bernardino plant utilizes newer and more efficient equipment; as a result, manufacturing costs are $0.50 per meter less than at, the EI Paso plant.

The company's rapid growth meant that not much attention was paid to the efficiency of the distribution system. Darby's management decided it is now time to address this issue. The cost of shipping a meter from each of the two plants to each of the three distribution centers is shown in Table 1.

The quarterly production capacity is 30,000 meters at the older EI Paso plant and 20,000 meters at the San Bernardino plant. Note that no shipments are allowed from the San Bernardino plant to the Ft. Worth distribution center.

The company serves eight customer zones from the three distribution centers. The forecast of the number of meters needed in each customer zone for the next quarter is shown in Table 2.

The cost per unit of shipping from each distribution center to each customer zone is given in Table 3; note that some of the distribution centers cannot serve certain customer zones.

Table 1 - Shipping Cost per Unit from Production Plants to Distribution Centers ($)

	Distribution Center		
Plant	**Ft. Worth**	**Santa Fe**	**Las Vegas**
El Paso	3.20	2.20	4.20
San Bernardino	-	3.90	1.20

Table 2 - Quarterly Demand Forecast

Customer zone	Demand (meters)
Dallas	6300
San Antonio	4880
Wichita	2730
Denver	6120
Salt Lake City	4830
Phoenix	2750
Los Angeles	8580
San Diego	4460

In the current distribution system, demand at the Dallas, San Antonio, and Wichita customer zones is satisfied by shipments from the Ft. Worth distribution center. In a similar manner, the Denver, Salt Lake City, and Phoenix customer zones are served by the Santa Fe distribution center, and the Los Angeles and San Diego customer zones are served by the Las Vegas distribution center. To determine how many units to ship from each plant, the quarterly customer demand forecasts are aggregated at the distribution centers, and a transportation/transshipment model is used to minimize the cost of shipping from the production plants to the distribution centers.

Table 3 Shipping Cost from the Distribution Centers to the Customer Zones ($)

	Costumer Zone							
Distribution Center	**Dallas**	**San Antonio**	**Wichita**	**Denver**	**Salt Lake City**	**Phoenix**	**Los Angeles**	**San Diego**
Ft. worth	0.3	2.1	3.1	6.0	–	–	–	–
Santa Fe	5.2	5.4	4.5	2.7	4.7	3.4	3.3	2.7
Las Vegas	–	–	–	5.4	3.3	2.4	2.1	2.5

Managerial report

You are called in to make recommendations for improving the distribution system.

1. If the company does not change its current distribution strategy, what will its manufacturing and distribution costs be for the following quarter?

2. Suppose that the company is willing to consider dropping the distribution center limitations; that is, customers could be served by any of the distribution centers for which costs are available. Can costs be reduced? By how much?

3. The company wants to explore the possibility of satisfying some of the customer demand directly from the production plants. In particular, the shipping cost is $0.30 per unit from San Bernardino to Los Angeles and $0.70 from San Bernardino to San Diego. The cost for direct shipments from EI Paso to San Antonio is $3.50 per unit. Can distribution costs be further reduced by Considering these direct plant customer shipment?

4. Over the next five years, Darby is anticipating considerable growth (10000 meters) to the north and west. Would you recommend that they consider plant expansion at this time?