

3.16. Designing a Distribution System The Krotzer Company manufactures and distributes meters used to measure electric power consumption. The company started with a small production plant in El Paso and gradually built a customer base throughout Texas. A distribution center was established in Ft Worth, and later, as the business expanded, a second distribution center was established in Santa Fe. The El 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 company opened a third distribution center in Las Vegas and just two years ago opened a second production plant in Sacramento.

Manufacturing costs differ between the company's production plants. The cost of each meter produced at the El Paso plant is \$10.50. The Sacramento plant uses newer and more efficient equipment, and as a result, its manufacturing costs come to only \$10.00 per unit.

The quarterly production capacity is 30,000 meters at the older El Paso plant and 20,000 meters at the Sacramento plant. No shipments are allowed from the Sacramento plant to the Ft. Worth distribution center.

Due to the firm's rapid growth, little attention has been paid to the efficiency of the distribution system, but company management has decided that it is 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 the following table.

Plant	Distribution center		
	Ft Worth	Santa Fe	Las Vegas
El Paso	3.20	2.20	4.20
Sacramento	–	3.90	1.20

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

Customer zone	Demand (meters)
Dallas	6300
San Antonio	4880
Wichita	2130
Kansas City	1210
Denver	6120
Salt Lake City	4830
Phoenix	2750
Los Angeles	8580
San Diego	4460

The cost per unit of shipping from each distribution center to each customer zone is given in the following table. Note that some distribution centers do not serve certain customer zones because the costs would be prohibitive.

DC	Customer zone								
	Dal	SA	Wich	KC	Den	SLC	Pho	LA	SD
FW	0.30	2.10	3.10	4.40	6.00	–	–	–	–
SF	5.20	5.40	4.50	6.00	2.70	4.70	3.40	3.30	2.70
LV	–	–	–	–	5.40	3.30	2.40	2.10	2.50

In the current distribution system, demand at the Dallas, San Antonio, Wichita, and Kansas City 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. The El Paso plant supplies the Ft. Worth and Santa Fe distribution centers, while the Sacramento plant supplies the Las Vegas distribution center.

You have been called in to make recommendations for improving the distribution system, and, in particular, to address the following issues.

- (a) If the company does not change its current distribution strategy, what will the distribution system cost be for the following quarter?
- (b) Suppose that the company is willing to consider dropping the distribution center limitations. In other words, customer zones would not necessarily be assigned to unique distribution centers, and distribution centers would not necessarily be assigned to unique plants. With this added flexibility, by how much could costs be reduced?
- (c) In the foreseeable future, the company anticipates moderate growth of about 20 percent in demand. Suppose this growth is met using the current routes and expanding plant capacity as needed. What plant capacities would be required? What would be the total system cost?
- (d) Relative to the cost in part (c), how much could both distribution flexibility and plant capacity save in annual expenses? What plant capacities would be required?