the total system cost associated with that plant configuration. Next, a different plant configuration is specified. The associated transshipment model is optimized, and the system cost associated with the second plant configuration is determined. The system costs associated with each plant configuration are compared, and the plant configuration with the lower cost is retained. In a similar manner, all feasible plant configurations are examined and eventually the optimal plant configuration is determined.

A more recent study by Fuller et al. uses a similar conceptual approach except they exploited the special structure of the transshipment model. The transshipment model can be reformulated into a transportation model (Hiller and Lieberman, Chapter 4) and as such is a member of a class of mathematical problems called networks. Algorithms far more efficient than the simplex method exist to solve network flow problems. These algorithms are usually heuristic in nature. One such algorithm was used by Fuller et al.

In the 1980s, the development of mixed integer programming algorithms, utilizing either the branch-and-bround method (e.g. MIP) or Bender's decomposition (Hilger et al.), has allowed direct solution of the plant location problem. Faminow and Sarhan, and Hilger et al. are studies which employ mixed integer programming.

Extension to Dynamic Models

French reviewed this literature, noting that a limitation of previous studies was their static nature. In particular, static analysis assumes that the period of observation of the model is a "snapshot" of a long-run equilibrium. This assumption is not appropriate when (a) the spatial pattern of supply and/or demand is changing and (b) the costs of closing existing plants and opening new plants is a significant proportion of total industry costs. Kilmer and Hahn relaxed the static assumption and projected dairy industry adjustment in size, number, and location of processing plants over time; however, the cost associated with opening and closing plants (transition costs) from one time period to another was not considered.

This bulletin uses a methodology developed by Sweeney and Tatham to handle dynamic plant location problems. A standard transshipment model with fixed quantities at supply and demand points is integrated with a dynamic programming model. A finite planning horizon is specified, say T periods, and the optimal size, number, and location of plants in each year is solved via mixed integer programming. The best R_t solutions for each time period, denoted by R_t^*, are rank-ordered, starting with the least-cost solution. Each solution represents a different configuration of plants. The optimal dynamic solution is the path which mini-