Chapter 6

Multi-Echelon Supply Chain Modeling with Dynamic Continuous Review Inventory Policy

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ABSTRACT

In this chapter, an integrated procurement, production and distribution supply chain model is developed in fuzzy environment and performance vector of the supply chain is determined by solving strategic model and tactical model iteratively. Mixed integer programming model is formulated through fuzzy goal programming approach in strategic level. In the tactical level, dynamic continuous review inventory policy for controlling of raw material inventory at supplier echelon, finished products at plant echelon and distribution center echelons is assumed. The inventory models are solved by considering the interdependency of economic order quantity and reorder point. The supply chain model, which is developed in fuzzy environment, finds compromise solution with multiple, vague and in-compatible objectives. Fuzzy goal programming techniques provide feasible solutions with flexible model formulation in decision-making problems, which involve human judgments in decision-making. Need for supply chain modeling with dynamic continuous review policy in fuzzy environment and the existing literature are outlined in Introduction. Fuzzy supply chain modeling with dynamic continuous review policy for controlling of the raw materials, finished products at plant and distribution center echelons is described in Fuzzy supply chain modeling section. Flow chart of the methodology is explained in Solution Methodology section. The proposed model is illustrated through a numerical example. Supply chain cost, Volume flexibility and unit costs are determined and presented in Results and Discussion section. Importance of the methodology and future scope is made in Conclusion section. This model finds application in the industries involving continuous production like oil and natural gas, steel manufacturing industries etc.

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INTRODUCTION

A supply chain consists of suppliers, manufacturers who convert raw materials into finished products and distribution-centers, from which finished products are distributed to customer zones. Hence, the inventory appears in the supply chain in the form of raw material inventory, work-in-process inventory and finished product inventory. Inventory control strategies must take into account the interactions of the various echelons namely, suppliers, plants, distribution-centers and customer zones in the supply chain to reduce total supply chain cost and improve customer service levels. An inventory replenishment policy consists of decisions regarding when to order and how much to order. These decisions determine the cycle inventory and safety inventories along with customer service levels. Two replenishment policies are often used are continuous review and periodic review replenishment policies. These policies may have impact on the supply chain cost, flexibility, and customer service levels.

