Systems Analysis Applied to Inventory Control. (August '69)

Dileep R. Sule, B.S. Ranchi University; India.

M.E. Texas A&M University

Directed by: Dr. Archie R. Burgess

There has been a tremendous amount of work done in the recent years in the area of Inventory Control. This is not surprising when one observes that in excess of 100 billion dollars are yearly invested in the inventory of private enterprises alone. So far all the published literature mainly concerns itself in finding the best policy for single element in the production-distribution system. A systems approach to the control of inventory is introduced in this paper, where a 'system' is composed of a supplier and the customer(s), making their decisions jointly to minimize the total cost.

In this study, the demand(s) of the customer(s) may either be deterministic uniform, or deterministic non-uniform. Different models are presented, depending on the supplier's production and the delivery policies, and whether the demands are deterministic and uniform or non-uniform. The basic model develops a mathematical expression for economic order quantity based on the customer's as well as the supplier's operating parameters.

In addition, the multiple shipment policy is introduced to obtain a substantial reduction in the inventory on hand. One of the techniques used in determining the optimum number of shipments is that of geometric programming.

It is also shown that if a system is composed of only two customers then it is possible to reduce the inventory on hand even further by proper scheduling. A very high set up cost may make it more economical to produce and store a quantity which may last for 'n' orders from the multiple customers. Special models are developed in this dissertation for a system which has only two customers with widely different demands. Geometric programming is applied when the deliveries are made in single shipment while the multiple shipment policy requires in an iterative type of solution.

In the case where the customer's demand is known but non-uniform, the problem is solved by dynamic programming. Here again the advantage of the systems approach is shown for two production policies, first, when the production is instantaneous and second when the production is at a constant rate.

The systems approach is also found to be advantageous in the single item stocking level problem. By marginal analysis it is shown that it is always possible

to increase the systems profit if the problem is solved by the systems approach.

The advantage of the systems approach are far reaching. In addition to achieving substantial savings in the operations, the systems approach further more may reduce the unit price and the order cost of the customer(s), improves the production and the transportation planning of the supplier and finally may minimize the storage requirements of both the supplier and the customer(s).

Computer programs are developed for easier manipulations with the different models.