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Problems and Solutions of a Class of Stochastic Green Supply Chain Management Models

So far, the manufacturing industries have adapted the carbon pricing policies to maximize the financial benefits and for better environmental protection. In the thesis, a stochastic deteriorating and stochastic demand item production inventory model in the environment of two echelon supply chain management (SCM) is proposed. We assessed the model through a numerical example and graphical demonstration and also comparison with different scenarios is provided. Our model is more generalized than other peer models because, both the deterioration rate of the item and the demand are stochastic rather than deterministic in our model. We found the stochastic nature of various parameters is more realistic than deterministic nature and the carbon emission cost is applied to optimize the whole SCM cost, which has a significant role in the reduction of carbon footprint.

In the thesis considered a two echelon supply chain (SC) under aspect of carbon cap and trade, where the two players of the SC are manufacturer, distributors. We have considered price and carbon emission dependent stochastic demand for single manufacturer and many distributors. We found the optimal values of distributor's base selling price, carbon foot print (emission) after carbon emission mitigation and manufacturer's wholesale price for unit product.

In the thesis, also considered the significant role of wireless communications for monitoring and to controlling supply-chain management of any organization.The system (we named it WARKS) can be implemented in home, industrial, hospital, farms, forest, agriculture and many more. To verify the system capabilities and work performance, we performed the experiment in indoor and outdoor using required hardware and software.

Also, in the thesis we have taken a single item probabilistic deterioration and considered two types of continuous probabilistic demand along with a fixed demand. Also we have considered carbon emission cost per delivery. Here we estimated minimum production quantity under probabilistic environment and used algebraic method to determine the minimum cost associated with the whole SCM. The objective of this paper is to find the minimum production quantity, minimum cost and optimum lot size with integer valued deliveries.

We developed a multi-retailer supply chain model, where single vendor supplies products to multiple buyers to satisfy stochastic and carbon emission dependent demand. The production rate and production cost are considered as a variable quantities. We have considered production cost as a function of production rate, which developed a special 'U'-shaped function and is used to develop the model. We have considered a single-setup-multi-delivery (SSMD) policy for delivering products to buyers from supplier. At the buyer's end, partial backorder is considered for shortages. The lead time demand is considered as stochastic and follows a normal distribution. Considering the market demand is affected by consumer's environmental awareness in addition form, the manufacturer considered the technological up-gradation under carbon cap and trade mechanism. Considering all such aspects this paper proposes the methods to determine the optimal order quantity and the optimal level of carbon emissions through model optimization.

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