Industry 4.0 Strategy to Reduce the Effect of CO_2 Emissions in Inventory Management Costs

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Abstract. Transportation is crucial for the appropriate flow of products throughout the supply chain. However, the associated emission of pollutants has negative effects on social and environmental welfare. Hence, a multi-factorial strategy is required to accomplish an effective trade-off between transportation, inventory supply frequency and CO_2 emission. In this case, the integration of Industry 4.0 technologies can address the complexity of this task. The present work studies the effect of CO_2 emissions on inventory supply frequency and operational costs. Then, through a case study with uncertain demand, the use of Industry 4.0 technologies is addressed to reduce emissions and costs. The analysis determined that reduction in transportation-associated CO_2 emissions can lead to a reduction in order frequency. Also, Industry 4.0 technologies can have a positive impact in the reduction of stock-out risks and safety stock costs.

Keywords: CO_2 Emissions · Industry 4.0 · Inventory Planning · Continuous Review · TSP

1 Introduction

Facilities, customers, and suppliers, are important elements of the Supply Chain (SC). These elements must be efficiently interconnected to achieve a fast and controlled product flow. Within this context, Distribution Logistics (DL) is focused on the efficient delivery of the finished products to the customer (supplier or retailer). Hence, DL consists of order processing, warehousing, and transportation.

While order processing and warehousing mainly involve inventory management, transportation involves, among other tasks, route planning. In recent

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