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CARBON EMISSION MANAGEMENT FOR GREENING SUPPLY CHAINS AT THE OPERATIONAL LEVEL

Seyed Hesameddin Anvar*, Ahmad Sadegheih, Mohammad Ali Vahdat Zad

Department of Industrial Engineering, Yazd University, Yazd 89195-741, Iran

Abstract

Increased concern about global warming in today's world has led to the legislation of regulations that seek to gradually reduce the amount of greenhouse gases emitted by industrial sectors and along their supply chains. This study focuses on the amount of carbon emitted in a two-echelon supply chain in which one supplier delivers a single product to a group of retailers and attempts are made to integrate and coordinate its different members. A mixed integer programming model is thus developed in which the problems of timing and the amount of replenishment for each retailer, the types of vehicles used for transportation as well as the amount of products that must be carried by each type of vehicle are addressed with the aim of reducing the overall cost of the supply chain and its carbon footprints. The objective of this research is to minimize the costs of transportation and those engendered by material handling and inventory holding activities as well as to reduce carbon emissions throughout the supply chain. In order to carry out various scenario analyses, some numerical instances are provided and solved. According to the results obtained, the supplier will opt for lower carbon vehicle types if replenishment timing, distances between members of the supply chain, the rate of carbon tax or the amount of retailers increases.

Key words: carbon emissions, coordination, green supply chain, operational decisions, mixed integer programming

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*Author to whom all correspondence should be addressed: e-mail: anvar@stu.yazd.ac.ir; Phone: +9821 22827846; Fax: +9821 22285704