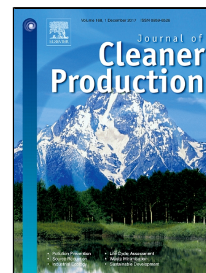


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Collection and Distribution of Returned-Remanufactured Products in a Vehicle Routing Problem with Pickup and Delivery Considering Sustainable and Green Criteria



Hamed Soleimani, Yusof Chaharlang, Hadi Ghaderi

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Collection and Distribution of Returned-Remanufactured Products in a Vehicle Routing Problem with Pickup and Delivery Considering Sustainable and Green Criteria

Hamed Soleimani^{a*1}, Yusof Chaharlang^a, Hadi Ghaderi^b

a: Faculty of Industrial and Mechanical Engineering, Qazvin Branch, Islamic Azad University (IAU), Qazvin, Iran

b: Department of Business Technology and Entrepreneurship, Swinburne Business School, Swinburne University of Technology, Hawthorn 3122 VIC Australia

Abstract

As increasing transportation costs mounts pressure on the businesses, there has been an increasing interest on vehicle routing problem (VRP) as a viable and effective solution. Both industry and academia are continuously looking for new approaches to save transport cost and time while increasing profit margins. This endeavor will eventually reduce costs of delivering goods and services for customers, and therefore enhancing the competitiveness of firms involved. Particularly, transportation cost savings could have potential impacts on marketing activities of remanufactured and recycled products in reverse logistics chains. Therefore, developing practical solutions for VRP of original and remanufactured products is one the emerging topics in the current transportation research. In this article, we propose a multi-objective non-linear programming model for the green vehicle routing problem (GVRP), including original and remanufactured products distribution (both delivery and pickup) of end of life (EOL) products. Through the appropriate fuzzy approach the model is linearized, validated, and solved. The results show considerable level of improved performance under the model configurations and proposed solution approach. The obtained results clearly indicate that the proposed mathematical model is capable of reducing the fuel cost, distribution center set-up cost and supplying vehicles, as well as minimizing air pollution. Finally, using a real case study the reliability and viability of the proposed model is verified.

Keywords: Vehicle routing problem; Green logistics; Greenhouse gas; Fuel consumption; Multi- objective; Reverse logistics.

1. Introduction

Since the price of remanufactured products is typically lower than the original products, the cost effectiveness of their distribution becomes a critical focus (Ferrer &

* Corresponding author: h.soleimani@qiau.ac.ir

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