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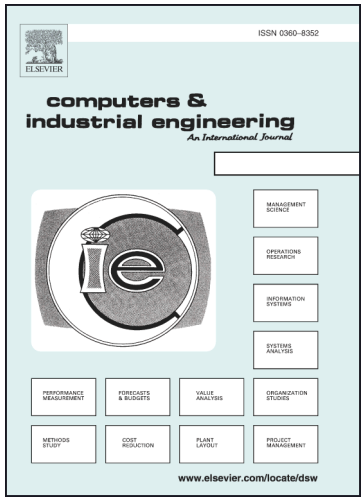

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Fuzzy Multi-Objective Sustainable and Green Closed-Loop Supply Chain Network Design

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Abstract

This article addresses a design problem of a closed loop supply chain, including suppliers, manufacturers, distribution centers, customers, warehouse centers, return centers, and recycling centers. The problem entails three choices regarding recycling, namely, product recycling, and components recycling raw material recycling. Modeling this chain is carried out by accounting for environmental considerations, total profit optimization, and reduction of lost working days due to occupational accidents, we well as maximizing responsiveness to customer demand. In order to solve the model, genetic algorithm has been used and multiple scenarios with different aspects have been studied. Solving this model provides decisions regarding opening or closing of each of the components of the network and the optimal product flow among them. The results prove the feasibility of the presented model and the applicability of the developed solution methodology.

Keywords: Closed-loop supply chain; sustainable supply chain; fuzzy logic; multi-objective optimization; genetic algorithm

1. Introduction

In recent years, due to governmental regulations as well as the ever-increasing attention to environmental impacts and preserving natural resources, reverse logistics and closed loop supply chains have come to the forefront of agendas by researchers and decision-makers. A classic or forward (progressive) supply chain consists of a network of suppliers,

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