Chapter 1
A Review of Reverse Logistics Models Based on Operations Research Techniques

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ABSTRACT

In response to the imperative of efficient resource use, value recapture, and environmental responsibility, companies are increasingly prioritizing reverse logistics (RL) activities. In today's dynamic business environment, effectively managing returned products has become essential for companies aiming to control costs, meet customers' expectations, and align with sustainability goals. This book chapter focuses on journal papers which were published between 2020 and 2023, focusing on RL optimization models. The publications reviewed in this chapter are categorized in problem domain and techniques of operations research. The problem domain is explored in three classifications comprising literature reviews (LR), deterministic reverse logistics models (DRLM), and uncertain reverse logistics models (URLM). This book chapter also reviews the related operations research and optimization techniques. This study concludes with discussions on observations and findings, along with suggestions for future research directions.

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INTRODUCTION

In recent years, Reverse Logistics (RL) has received significant attention from different aspects, and numerous researchers have delved into it. Saxena et al. (2023) stated that the growing environmental awareness among consumers and corporate responsibility have led to increased focus on RL and return policies. In response to overpopulation and insufficient environmental resources, the concept of RL has emerged as a crucial solution (Kilic et al., 2023). Lei et al. (2023) highlighted the importance of disassembly centers that optimally determine the disassembly process, manage inventory, and plan vehicle routes for the collection of products and delivery of materials. A well-developed Reverse Logistics Network (RLN) is essential for waste recycling, reducing costs, increasing profits, and enhancing efficiency (Liao and Luo, 2022).

In forward logistics, the main objectives include production, distribution, and fulfillment of customers' needs. On the other hand, RL is primarily focused on maximizing the utility of used products to improve economic efficiency and minimize irreversible environmental effects. Companies that neglect to design RL in advance may face the challenge of redesigning the RL supply chain network based on their existing forward logistics structure (Gao and Cao, 2020). In some industries, such as batteries and electric devices, it is crucial to consider RL due to the significant environmental impact of end-of-life products (Lin et al., 2023; Liao and Luo, 2022). In RL, several key decisions need to be made to efficiently manage the flows of products from the end-user back to the origin. Some of the main decisions include product disposition, RL network design, remanufacturing, transportation management, and inventory management. Fig. 1 illustrates a general RL network.

While numerous reviews on RL have been conducted in recent years, this book chapter specifically concentrates on new journal papers published between 2020 and 2024. This literature review summarizes 23 papers obtained on ScienceDirect using 'Reverse Logistics' as the primary search keyword. Our focus is on RL and the application of optimization (mathematical) models in this field. Additionally, we explore both deterministic and uncertain models in the context of RL.

The rest of this chapter is formatted as follows: Section 2 introduces the taxonomy and the classification of the literature review. In Section 3, we delve into the observations and suggestions. Finally, Section 4 covers the conclusions and outlines areas for future research.

Liquefaction and Dynamic Properties of Assemblies with Particles of Spherical and Ellipsoidal Shapes: A Discrete Element Approach

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