An optimization model for the design of a capacitated multi-product reverse logistics network with uncertainty

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Abstract

In this work the design of a reverse distribution network is studied. Most of the proposed models on the subject are case based and, for that reason, they lack generality. In this paper we try to overcome this limitation and a generalized model is proposed. It contemplates the design of a generic reverse logistics network where capacity limits, multi-product management and uncertainty on product demands and returns are considered. A mixed integer formulation is developed which is solved using standard B&B techniques. The model is applied to an illustrative case.

Keywords: Reverse logistics; Optimization model; Uncertainty

1. Introduction

One of the first definitions of reverse logistics was provided by Stock (1992): “... the term often used to the role of logistics in recycling, waste disposal and management of hazardous materials; a broader perspective includes all issues relating to logistics activities carried out in source reduction, recycling, substitution, reuse of materials and disposal”.

Later, Fleischmann (2001) proposes a new definition: “reverse logistics is the process of planning, implementing and controlling the efficient, effective inbound flow and storage of secondary goods and related information opposite to the traditional supply chain directions for the purpose of recovering value and proper disposal”. In this definition products do not have to return to the origin. The author uses a broad concept of secondary products, which includes non-used products. When referring to inbound flow (…) opposite to the traditional supply chain directions, Fleischmann leaves out from this definition the reuse of organic waste.

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