

Chapter 2

The Distribution and Pickup of Goods: A Literature Review and Survey

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ABSTRACT

The literature of vehicle scheduling problems is rich with different approaches, which try to schedule the distribution of products to a network of clients. In this case, the vehicle routing problem with deliveries and pickups of goods is an extension of vehicle routing problem in which goods are transported from a depot (or multiple depots) to customers, as well from customers to the depots. There is tremendous work in the literature of this problem. Freight transport management deals with all distribution problems along the supply chain. This chapter presents a comprehensive review and survey of this literature. The literature is classified into four fundamental classes according to the way of the customers' visit and methods used for solving. Then different variants are generated according to the elements of the proposed framework. During this chapter, based on a proposed framework, the authors analyze the literature of the vehicle routing problem with deliveries and pickups, and as a result, the researchers propose a new classification where they give a short modeling of it.

DOI: 10.4018/978-1-5225-7299-2.ch002

INTRODUCTION

The vehicle routing problem (VRP) is an important problem of goods distribution that concerns the design of routes from a depot to a set of customers geographically dispersed. The first authors, who studied this problem, were Dantzig and Ramser (1959). In their work, the authors study the question of the optimum routing of a fleet of gasoline delivery trucks between a bulk-terminal that supplies a large number of service stations. The shortest routes between any two points in the system are studied to minimize the total mileage covered by the fleet while satisfying the station demands. The authors proposed a procedure based on a linear programming formulation to obtain a near optimal solution.

From this year, different authors have studied the problem using combinatorial optimization and integer programming approaches to allocate a fleet of vehicles in order to service a number of customers. The proposed approaches can be applied in the fields of transportation, logistics & distributions.

The vehicle routing problem with collection and delivery (VRPCD) is an extension of vehicle routing problem (VRP) where the goods are transported from a depot (or multiple depots) to a set of customers, as well from a set of customers to the depots or other customers. The literature of the VRPCD is rich with an increasing number of approaches proposed during recent years considering different varieties, characteristics and assumptions proposed by authors. This recent problem can be applied in the distribution, for example in the beverage industry, as well as in the reverse logistics.

In order to classify the existing approaches of the vehicle routing problem with collection and delivery (VRPCD), in this paper based on a proposed framework of analysis, the literature of the VRPCD is classified into four fundamental classes according to the way of the customers' visits and methods used for solving them, then, different variants are generated according to the elements of the proposed framework. The remainder of this paper is organized as follow: section two to five present a description of the research methodology including our framework of analysis and an analysis of different characteristics and approaches of the literature. Section six provides a classification for vehicles routing problems with collections and deliveries. Section seven analyzes and describes methods of resolution and characteristics of problems treated. And finally, conclusions and directions for future research.

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