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A real-time resource and pickup route management system for warehouse operations

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Abstract

A warehouse is one of the essential components in linking supply chain partners. As a matter of fact, it is necessary to manage warehouse resources effectively in order to enhance the productivity and reduce the operation costs. Due to the characteristics of just-in-time and make-to-order mode manufacturing, small batches of production materials have to be delivered from a warehouse to production facility frequently within a short period of time. Hence, different operations of warehouse like receiving, shipping, storage, and order picking have to be well organized using appropriate available resources to cope with daily demand. In this paper, a real-time resource and pickup route management system (RPRMS) for managing warehouse operations is described. Through using RPRMS, real-time production and warehouse operations are monitored by Radio Frequency Identification (RFID) technology, and a genetic algorithm (GA) technique is applied to formulate feasible pickup routes for production material requests. A case study shows that R-RPRMS generates pick-up route plans very efficiently.

Key words: RFID, GA, resource management, pickup route management

1 Introduction

In today's highly competitive globalized market, manufacturers have to improve their manufacturing performance continuously in order to sustain their competitive advantage [1]. Many papers in the literature highlight the fact that production planning and scheduling plays a significant role in improving manufacturing performance so as to fulfill customers' needs [2; 3]. In order to make a production plan and schedule effective and efficient, the support of production materials is essential. Based on a production plan and schedule, production materials stored in a warehouse will be sent to production floors, according to the production demand and the availability of warehouse resources. Numerous researchers have suggested production-and-warehouse solutions to manage these two domains simultaneously [4; 5; 6]. In general, they all emphasized the importance of minimizing inventory cost while providing sufficient quantity of production materials to the production floor for fulfilling customers' demands. However, they focused solely on determining a production schedule with a finite inventory level and on ordering sufficient inventory before production starts. Little attention has been paid to the importance of coordinating warehouse operations in order to provide and replenish materials for daily production operations.

Due to the characteristics of just-in-time and make-to-order mode manufacturing, small batches of production materials have to be delivered from a warehouse to production shop floors frequently within a short