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Computer simulation as a tool for the optimization of logistics using automated guided vehicles

Vladimír Vavrík[a]*, Milan Gregor[a], Patrik Grznár[a]

[a]*University of Žilina, Faculty of Mechanical Engineering, Department of Industrial Engineering, Univerzitná 1, 010 26 Žilina, Slovak Republic*

Abstract

The article describes results of the research project and at the same time, it introduces the method of the determination of number of automated guided vehicles and choosing of optimal internal company logistics track. New technologies are fundamentally changing the internal logistics and internal logistics is therefore gradually becoming adaptive, and that requires changes in the whole concept of future solutions. One example is automated logistics system of planned operation of manufacturing semi-products intra-process of components production in the automotive industry. The simulation results of the logistics system were variants for increasing the use of the operation areas, optimized material supply and created layout that would be able to flexibly response to the future company requirements.

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Keywords: Computer simulation; automated guided vehicle; automated logistics system; plant Simulation

1. Introduction

The utilization of computer simulation considerably supports production planning and control. It is one of the main parts of the digital factory. The simulation enables the imitation of a suggested solution to determine the system's parameters in order to reach requested goals. One of the primary goals of each company is to increase the effectivity of the particular processes by using simulation. Simulation enables imitate process in production area, logistics,

* Corresponding author. Tel.: +421-41-513-2713; fax: +421-041-513-1501
E-mail address: vladimir.vavrik@fstroj.uniza.sk

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assembly etc. The article deals with the internal logistics in the factory, which aims into production volume growth. Such changes will require a new internal logistics routes. Tecnomatix Plant Simulation software from SIEMENS Corporation was used in this simulation project of new logistics. The Software is a component of PLM, whereas it allows analysis of all process in discrete time. [1,2]

2. Targets definition and problem analysis of the factory

The logistics situation in the factory is a combination of automated logistics and typical forklift transport. Growing market demand resulting in the product volume growth caused the extension of one of the production halls and purchase of new machines for semi–finished products processing. This process influenced localization of former technological process in the factory and induced need for the new logistics track. To achieve effective transport by using new track it is necessary to choose a suitable logistics vehicle and to optimize transport track. For logistics, the transport with automated guided vehicles was chosen, which substantially reduces needs of the labor force and provide effective transport of the semi-finished product. After the type of transport has been chosen, it was necessary to design the track itself, so three different variants were proposed. These proposed tracks had to be evaluated. Simulation and bottlenecks analysis were used to evaluate the actual production conditions. However, the main aim of all simulation experiments was to estimate a required number of transport vehicles, which must be implemented into the operation of the business. [3,4] Simulation project in this article follows the methods, where the concept of simulation model needs to be preceded by static calculation of necessary number of vehicles. This calculation is a base for dynamic simulation and it can be used only for initial validation of the basic model. The more exact are input parameters, the more exact are the results of the dynamic simulation, and so the results of simulation experiments usually differ from static calculation (Fig. 1).

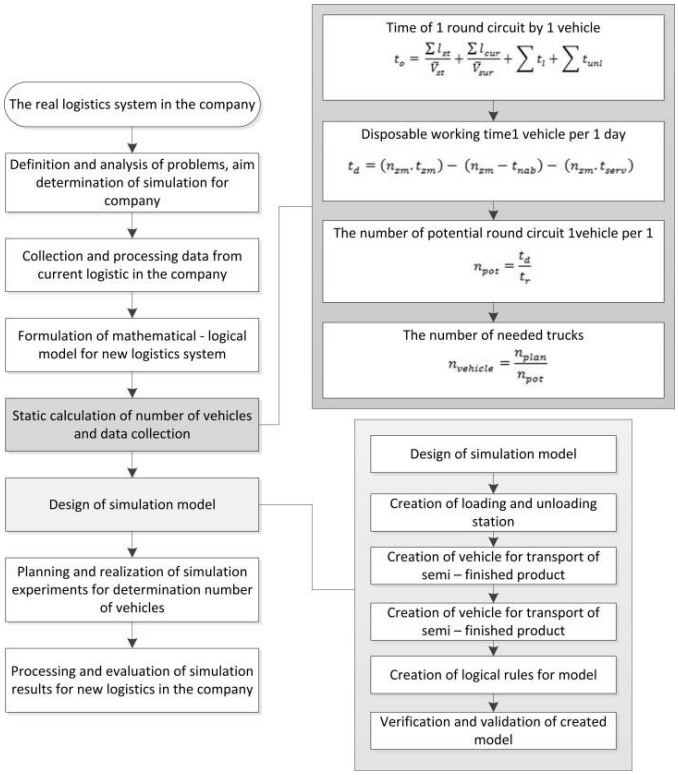

Fig. 1. The method of simulation model development for the factory (Source: own construction).