

**POSTĘPY W INŻYNIERII MECHANICZNEJ  
DEVELOPMENTS IN MECHANICAL ENGINEERING**

5(3)/2015, 33-40

Czasopismo naukowo-techniczne – Scientific-Technical Journal

---

Michaela JANOŠOVÁ, Rastislav ŠKULEC, Marek HALENÁR,  
Lubomír HUJO

**REPORT MATERIAL FLOW IN THE FACTORY REAL-TIME  
INTEGRATED IN THE ENTERPRISE RESOURCE PLANNING  
(ERP SYSTEM)**

**Abstract:** To ensure a flow production is always necessary to provide the inputs and outputs of materials in line with customer requirements ie. design and implement the most efficient material flow. As the basis of efficiency is considered to be straightforward and simple course, a low rate of material flow, enabling the creation of larger, integrated volume handling units with which it operates as a single piece using mechanization. Straightforward and simple course depends on optimal spatial layout of the company (production and storage buildings) as well as a series of individual operations and the appropriate organization of production. In terms of control and management of material flow is the most important right choice and tuning of the management and material flow control

**Key words:** ERP system, material flow, handling unit, manufacturing and warehouse space, management system

## 1. INTRODUCTION

In the past in the primary production were use machines that were designed for specific operations. This versatility does not avoid neither transport logistics within the farm. Transport and Manipulation Technology is currently a full-blown technical system that effectively cooperates with the production systems in the industrial sector, but is also widely used in non-industrial and non-manufacturing sectors [1].

Handling processes affect the stability and efficiency of the manufacturing process. Their objective necessity and proportion of value creation is contrary to their backwardness, which only emphasizes the primacy of the development of these processes. Handling operations are provided by removing material from the outbreak to local needs and consists of a summary of handling and auxiliary operations necessary for their implementation.

Handling operations is defined as intentionally performed continuously change the position of the subject of one device or means used in material handling or by one worker.

---

Michaela JANOŠOVÁ, Rastislav ŠKULEC, Marek HALENÁR, Slovenska Polnohospodarska Univerzita v Nitre Technicka Faculta, e-mail: lubomir.hujo@uniag.sk

Lubomir HUJO, Slovenska Polnohospodarska Univerzita v Nitre Technicka Faculta, Katedra Dopravy a manipulacie, e-mail: lubomir.hujo@uniag.sk

Materials Handling and transport have their identity and function in production and circulation. Choice of handling equipment has a significant impact on the efficiency of the technological process and plant operations. Therefore it is necessary that the selection is based on a thorough analysis of material flow, qualitative – quantitative characteristics of the conveyed materials and technical parameters of transport and handling and the local situation [2].

Material flow management objective is to minimize material handling. Minimizing operations are undertaken by a group of facilities and equipment (transport, shipping, lifting, etc.) Forming the support of the whole ERP system providing data records.

The selected company operates in the industrial zone in city of Vrábce since 1995 (Fig. 1). The company is a major manufacturer of metal stampings and construction units, the offer includes a variety of sheet metal molded parts as separate components or assemblies used in various fields. The products of the company concerned find use in many industries, however, mainly in the automotive industry.



Fig. 1. View of the manufacturing plant

## 2. METHODOLOGY OF WORK AND METHODS OF MEASUREMENTS

Objective scientific paper was to investigate the material flow volume of complete handling units, as well as incomplete handling units in real time of their creation in the manufacturing cycle time by direct flow of information in the Asset Tracking (ERP) using barcodes and barcode readers, as an interface to ERP system. Transferring the information covers the entire production, storage, shipment and distribution zone manufacturing plant. Material flow assumes the functionality of a full FIFO principle and unambiguous identification of each handling unit.

Materials Handling is therefore an integral part of the production process and addresses mainly the following specific issues:

- relations in the production process and circulation,
- methods and techniques in use in handling operations in various sectors of production and circulation,
- methods of organization and management of material handling in production processes and circulation.

Material flow together with information and financial flows provides basic image operation of logistics in the enterprise. Only high-quality information on its size, direction, frequency and so on. It allows efficient means to plan served basis without creating too much power or losses. However, the problem must be addressed comprehensively, along with other cost logistics costs and to achieve a reduction in the total cost of logistics in ensuring the required logistics services.

### **Own work**

In addressing the issue we started from the initial state, where he created one virtual enterprise zone to records, the records of which took place on the basis of reports by heads of manufacturing them arbitrarily selected cycle, at least 1 times a day. The goods were chaotic deployed in areas of production, identification of the goods was not only based on product type and prepayments, respectively. Identification of goods in the production area was difficult and possible only based on the identification label located on the handling unit, which significantly prolonged the picking time and led to a slowdown in the overall production process.

To address the project we approached the following levels:

a) theoretical evaluation of solving the problem:

- Formulation of the problem,
- Identification of substantive system (capture the essence quantities)
- Creating an artificial system (system modeling)
- Testing and algorithm development
- Interpretative analysis.

After the theoretical evaluation address the problem we proceeded to practical solutions to the following descriptions for each step:

b) practical solution to the problem:

- Develop a standard for unambiguous identification of the handling unit
- Creating conditions and interfaces for recording goods in real time
- Identification of material flows
- The establishment of a registration virtual environment in the ERP system reflects the true material flows,
- Create a storage space, indicating the storage zones, taking into account the flow of goods.

For the unambiguous registration of the handling unit was created standard that is used as the input quantity planned order for production of a particular work. Proposal planned orders generated by the ERP system automatically taking into account the actual needs of customers in specific parts, designed production order has manager on the basis of current capacity and material available in production release for production. Production order contains data on the manufacturing process, the number of products in one handling unit and the required product. Production Order in printed form includes a bar code, which is used to generate records handling units with manufactured goods. In practice this means that, after manufacturing production worker completed handling unit under the scanner production order, which in turn made parts recorded in the ERP system in real time and unit be assigned a unique identification number under which he is registered in the ERP system, which It serves both to ensure traceability and ensure FIFO system functionality.

### Tackling

In order to achieve the aim was needed at the factory breakdown for individual areas specifically demarcated zones, among which there are ongoing material flows:

- warehouse handling units packaged by the packaging regulations,
- storage of packaged handling units with fewer parts, such as packaging regulation
- area intended for the handling unit to report back to the ERP system,
- manufacture,
- area intended for the shipment of goods to customers and co-operations.

Distribution warehouse space can be seen in Fig. 2.

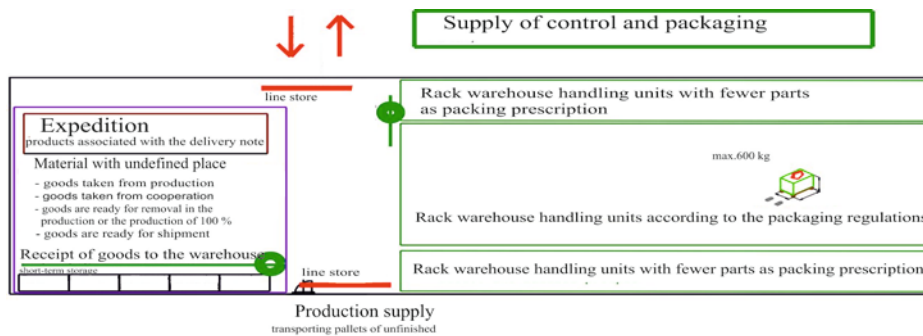


Fig. 2. Organizational division of warehouse space

Definition warehouse areas:

Storage area "material with undefined storage places".

This area of the warehouse is a purple trim and consists of open spaces and the warehouse shelves along the wall contained pressroom.

Handling units are in accordance with the undefined storage places accept only the following motions:

- poor reporting of production, respectively. 100% control of the production and packaging by scanning the contract under which they were manufactured parts,
- the adoption of the delivery note of the cooperation projects.

Parts of the area under an undefined storage places can be stored exclusively the following procedures:

- stock in bay warehouse, if it is a full pallet wrapping by regulation in the area specified for handling units packed in accordance with packing or regulation. If it is a work in progress in handling units defined for them. Stock at the handling unit is assigned a position on the store shelves;
- to dispatch in manufacturing, degreasing, or to control a pack exclusively compared to production orders by creating a transport order and confirmation of motion using a bar code reader;
- to dispatch the expedition compared to the delivery slip duly created a transport order.

On the dispatch it must be certified by the transport command.

### **Area bay warehouse**

It is an area of storage racks designed to manage the basics of handling units (cardboard boxes, steel containers, etc.) only the packaging of full – full prescribed amount.

Parts warehouse in regálovégho accept only the following motions:

Stocking parts of the area of the warehouse undefined place in store shelves by ERP transactions and select the command "to stocking store shelves".

Parts of the area bay warehouse can be preskladnené exclusively the following procedures:

Removal on the basis of transport orders in SAP compared to the production order, the contract for inspection and packing or against the delivery note. On the dispatch it must be certified by the transport command.

Stock transfer of goods from one bay warehouse storage location to another storage location can be made only in the case where the movement is at the same time duly recorded in the ERP system through the appropriate transactions and manual confirmation of the warehouse order by scanning barcodes handling units and warehouse locations.

### **Area bay warehouse handling units unwrapped by the packaging regulations**

It is a stationary racks standing along the walls of the warehouses, the function is identical to the field of warehouse storage rack for complete handling units with the difference that in this area zaskladňujú parts that are not packed in accordance with proper packaging regulations, ie a number of parts not corresponding quantities prescribed by the packaging regulations.

Parts in bay warehouse for incomplete handling units will be accepted only following movements:

Stocking parts of the area of material with undefined storage places in racking warehouse using ERP transactions and select the command "put away into storage racks".

Parts of the area designated for storage racking incomplete handling units can be removed from storage exclusively the following procedures:

Removal on the basis of transport orders in the ERP versus production orders, contracts for inspection and packing or against the delivery note. On the dispatch it must be certified by the transport command.

Stock transfer of goods from one bay warehouse storage location to another storage location can be made only in case, if this movement is part of a properly registered in the ERP by the corresponding transaction and confirmation of the warehouse order by scanning barcodes handling units and warehouse locations.

### **Warehouse area "production supply"**

This store represents material provided in the production or for further refinement. The control department and packaging, or repair.

Any material that physically leave the area or bay warehouse not allocated pursuant to storage places for further processing or repair. repackaging must imperatively be reversed to the warehouse area "production supply", ie, material in production.

Parts can be reclassified in stock "production supply" just following movements:

By creating a transport order in the ERP transaction solely against the recorded production orders, respectively. contract for inspection and packaging, or repair.

Parts of the "production supply", i.e. the manufacture, inspection, packaging, or repairs can be stored back solely to the material stock material to storage places not allocated" and only following procedure:

- poor reporting of production, respectively. inspection and packaging by scanning production order based on which parts have been produced.

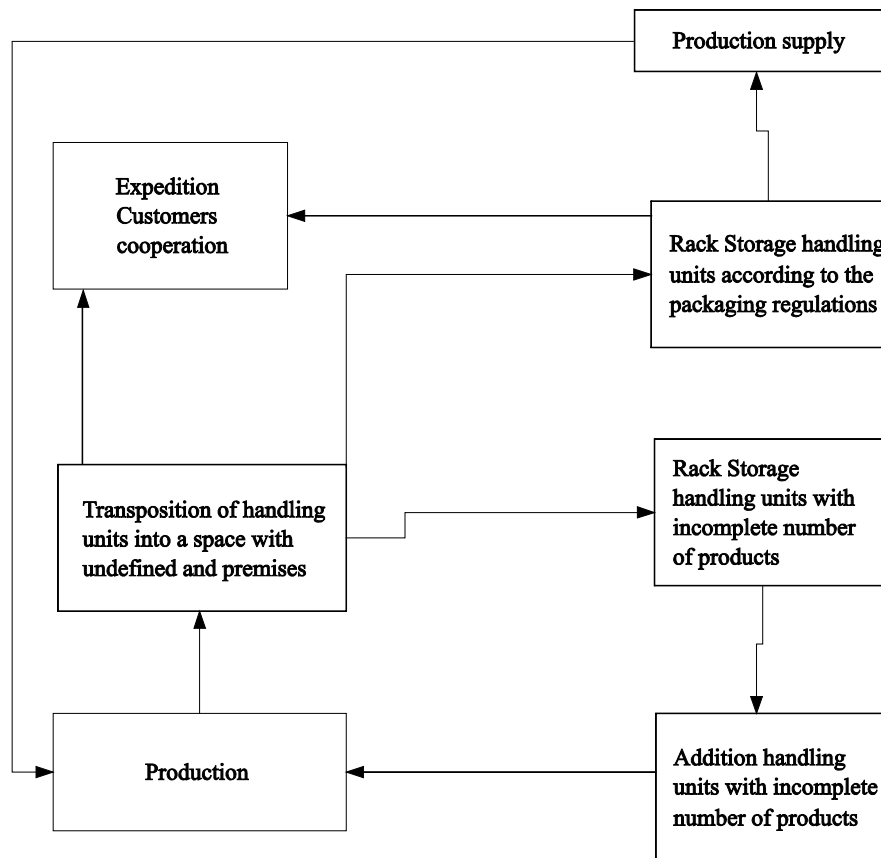


Fig. 3. Plant material flows

### 3. RESULTS

Economic development during this century, which is characterized by rapid growth businesses and their expansion to various markets, triggered a strong push for a coordinated and monitored movement of all material and value flows [4].

We focus on shortening the processing time, optimum distribution of work, the opportunity for automated inventory tracking, and ways to save money spent on stocks and handling processes.

Indicators of material handling salient proposals in optimization of transport – handling flows, the new proposals are intended to reduce costs in the handling, increase production capacity and not least the increase in labor productivity [1].

The goal was based on the monitoring of material flow volume of coherent and fragmented handling units, using the identifiers set at the factory specifically defined areas, among which there are ongoing material flows, the current condition monitoring of production and circulation of products to shipping.

The result of this work was the creation of the demarcated zones in Fig. 3 and material movement with a simple description. The proposed system of material flow has managed to implement in a manufacturing enterprise, which are governed by the scheme described in the section own work, to achieve continuity of the production process.

## REFERENCES

- [1] JÁNOŠOVÁ M., HUJO L.: Riešenie dopravno-manipulačných tokov materiálu vo výrobnom procese. [In:] Najnovšie trendy v poľnohospodárstve, v strojárstve a v odpadovom hospodárstve, I, vyd. 1 CD-ROM (362 s.), ISBN 978-80-552-1014-8, Slovenská poľnohospodárska univerzita Nitra, 2013, CD-ROM, 157-163.
- [2] JASÁŇ V. a kol: Teória dopravných a manipulačných zariadení. 1 vydanie, Bratislava, 1989.
- [3] MOŽIŠ M., VARGA D., GRMAN L.: Profesne vzdelávanie pre potreby logistiky. Zborník medzinárodnej vedeckej konferencie AGROTECH NITRA 2001, MF SPU Nitra, 2001.
- [4] KOSIBA J., TULÍK J.: Podiel dopravnej logistiky pri prevádzke poľnohospodárskeho traktora. [In:] Viediecke stavby v európskych regiónoch II, 1. vyd. 1 CD-ROM (184 s.), Slovenská poľnohospodárska univerzita Nitra, 2014, CD-ROM, 157-160.