

distribution, materials handling, transport cycle

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## **THE ORGANIZATION OF MATERIALS HANDLING IN A DISTRIBUTION PLANT**

**Summary.** The organizational structure of materials handling is illustrated with an example of a distribution plant. A route for a materials flow was outlined on the architectural design and necessary transport operations were described. A model shipping unit was selected, for which a materials flow process chart and a transport cycle chart were drawn up.

## **ORGANIZACJA TRANSPORTU BLISKIEGO W ZAKŁADZIE DYSTRYBUCYJNYM**

**Streszczenie.** Przedstawiono strukturę organizacyjną transportu bliskiego na przykładzie zakładu dystrybucyjnego. Na podkładzie architektonicznym wyznaczono drogę przepływu materiałów i opisano konieczne operacje transportowe. Wybrano przykładową jednostkę ładunkową, dla której sporządzono kartę procesu przepływu materiału i kartę cykli transportowych.

### **1. INTRODUCTION**

Materials handling refers to relocation, packaging and storage of materials in any form within one plant. The organization of materials handling results from the functions and objectives of a given plant. In a distribution plant it covers the materials flow from the delivery place, through the storage and packaging place up to the room for finished shipping units.

Not only the internal relations are taken into account when organizing the materials handling - the organization must be open also to the external links. Superior logistic systems often demand a lot. The requirements must be approved and fulfilled by individual units connected with these systems.

The means of materials handling available in the plant and the qualified staff make up the basis for the plant materials handling programme. The quality of the materials handling programme is determined by accuracy of the selection of appropriate handling means as well as by the qualifications and commitment of those who operate them.

### **2. MATERIALS HANDLED WITHIN THE INTERNAL SYSTEM**

Materials handled within a plant are to be described and identified in detail. Therefore, it is necessary to determine basic data describing the handled materials, the packaging unit and the shipping unit.

A model list including such data is presented below.

**Material unit/Packaging unit:****Material description:** chain saw**Physical properties:** diverse, suitable for the material used; mostly plastic and metal components (mostly aluminium)**Shape:** irregular, diverse**Dimensions:** 300 x 400 x 800 mm.**Weight:** 35 kg**Packaging:** cardboard box, EPS elements and protective foil**Loading:** wooden pallets**Shipping unit:****Type:** Euro pallet**Number of packaging units:** 12 pcs**Dimensions:** 800 x 1,200 x 1,200 mm.**Weight:** 420 kg

Each material or packaging unit is marked in a visible spot with an identification label containing full necessary information data.

### 3. ANALYSIS OF THE MATERIALS FLOW

In the distribution plant in question the route and the way of handling materials are forced by the local conditions resulting from the plant's operation. The simplest way to present a material flow is to use a full line that runs from the point of departure, i.e. from the first commodity identification spot to the shipping place outside the plant, with the arrows indicating the handling direction (Fig. 1).

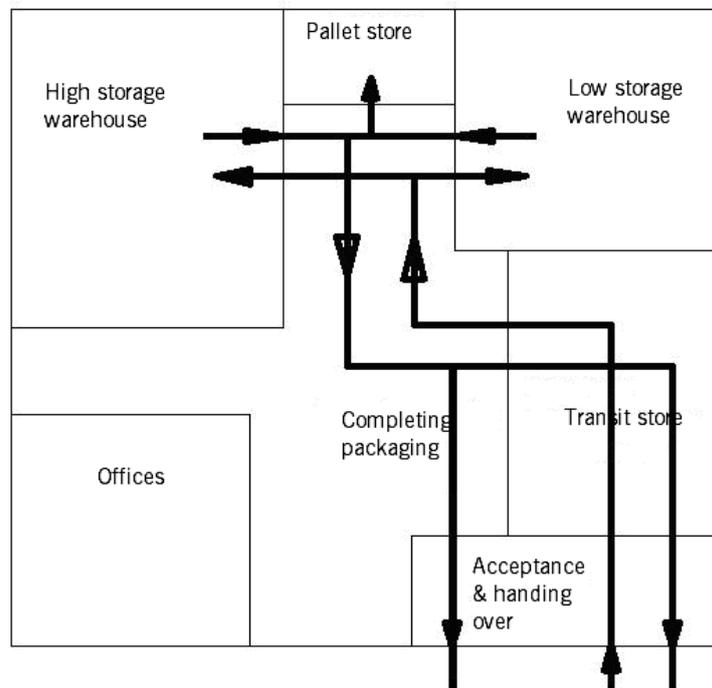


Fig. 1. Materials flow diagram on an architectural design

Rys. 1. Wykres przepływu materiału na podkładzie architektonicznym

The same diagram with symbols of individual handling activities marked on it is presented in Figure 2.

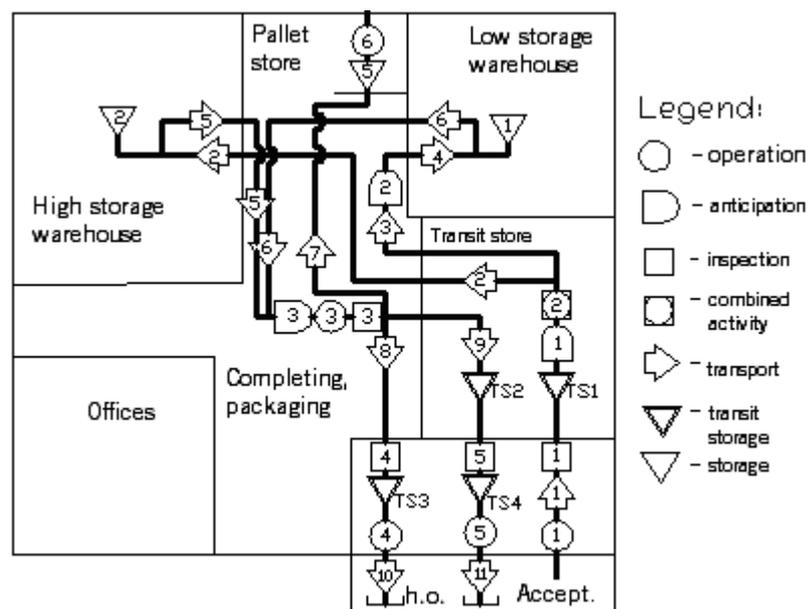


Fig. 2. Materials flow diagram with the handling activities marked on it  
Rys. 2. Wykres przepływu materiałów z oznaczonymi czynnościami

#### 4. HANDLING MEANS

Appropriate handling means are to be chosen for each operation or handling process, with the functional (technical) and economic criteria taken into account as the basis.

The set of material handling means and loading devices in the distribution plant in question includes the following items:

- forklift truck with the storage height of 7 m,
- hand-operated forklift truck with the storage height of 5 m,
- hand-operated lift truck,
- roller conveyor with a lift,
- roller transporters,
- workstation scissor lift,
- hand-operated two-level transport trucks with various wall and side structures,
- height adjustable loading platform,
- stationary loading platform,
- stationary ramp.

#### 5. ANALYSIS OF THE ORGANIZATIONAL STRUCTURE OF THE MATERIALS HANDLING

For the organization of materials handling, the assumed materials flow and the available technical transport means are taken into account.

The basic documents illustrating a materials handling system are:

- materials flow process chart,
- transport cycle chart.

The materials flow chart for the distribution plant demonstrated in this paper is presented in Figure 3.

Figure 4 shows a model transport cycle chart for materials handling of 120 chain saws brought to the plant in cardboard boxes placed on 10 pallets.

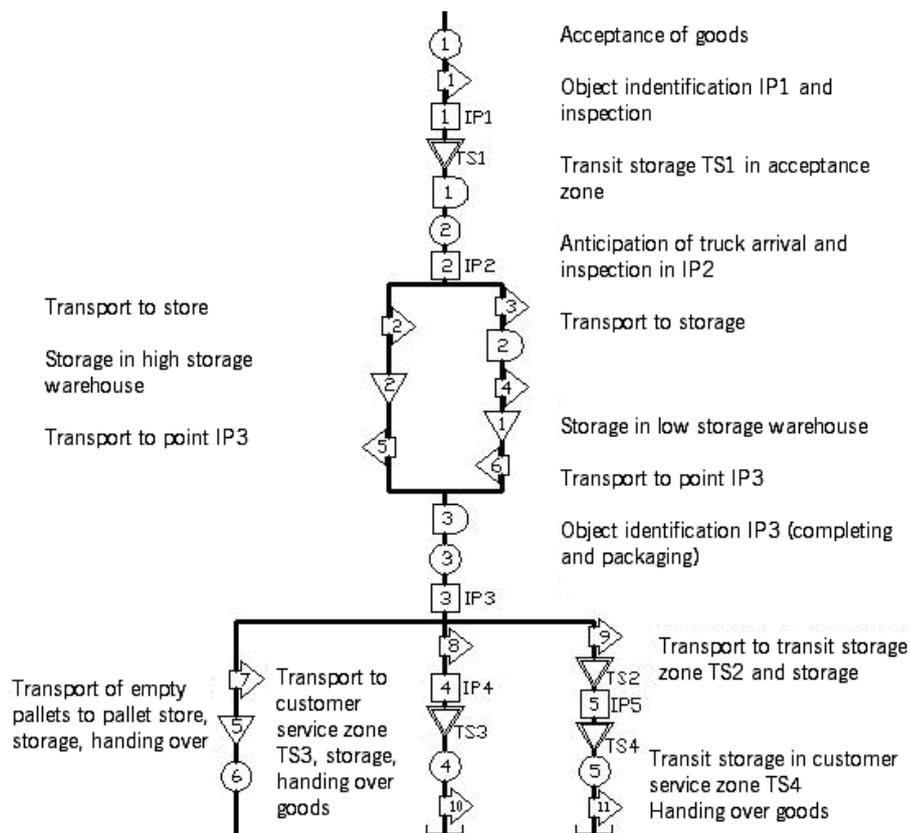


Fig. 3. Materials flow process chart  
Rys. 3. Karta procesu przepływu materiałów

The handling activities for this batch of materials are as follows (the bracketed notes refer to the markings given in Fig. 2):

- cycle 1: the hand-operated lift truck transports pallets from the van to the transit store; route length: 5 m; number of pallets: 10, so the truck makes 10 runs (transport 1);
- cycle 2: the hand-operated forklift truck transports the pallets from the transit store to the high storage warehouse and places the materials onto shelves; 10 runs within the distance of 12 m (transport 2);
- cycle 3: the forklift truck transports the pallets from the warehouse to the completing and packaging spot; 10 runs within the distance of 10 m (transport 5 and 6);
- cycle 4: pallets unpacking, completing and packaging of shipping units; 120 packaging units relocated within 1 m. (operation 3);
- cycle 5: the hand-operated lift truck brings empty pallets from the warehouse to the completion point; 1 run within the distance of 8 m (transport 7);
- cycle 6: the hand-operated lift truck transports the pallets with shipping units to the transit store before the shipment; 14 runs within the distance of 7 m (transport 8 and 9);
- cycle 7: the forklift truck loads the pallets (no ramp) onto a van; 14 runs within the distance of 5 m (transport 10 and 11);
- cycle 8: the hand-operated forklift truck arranges the pallets on the van; 14 runs within the distance of 3 m.

The transport cycle charts clearly shows the separate handling activities and offer a possibility of determining the total transport time as well as the overall time for separate transport means. This data forms the basis for the transport process dimensioning within the plant.

Subject of the process: Transport of chain saws Process starting point: Acceptance - Loading ramp Process end point: Handing over - Loading ramp									
Cycle No.	Cycle description	Distance [m]	Transport process				Number of cycles	Cycle time [min]	Total time [min]
			what	where from	how	where to			
1	unloading	5	┌┐12	└┘	└┘	△	10	1	10
2	internal transport	12	12	△	└┘	△	10	3	30
3	internal transport	10	┌┐12	△	└┘	D	10	2,5	25
4	completion	1	K	┌┐12┘	○	┌┐7	120	0,1	12
5	internal transport	8	┌┐7	D	└┘	△	1	1,5	1,5
6	internal transport	7	┌┐7	D	└┘	△	14	1	14
7	loading	5	┌┐7	△	└┘	└┘	14	1	14
8	loading	3	┌┐7	└┘	└┘	└┘	14	0,5	7
Overall operation time for forklift truck: 69 min. Overall operation time for lift truck: 32.5 min. Total internal transport time: 113.5 min. Note: Cycles 7 and 8 can run at the same time.									

Fig. 4. Transport cycle chart for noting and analyzing materials handling  
Rys. 4. Karta cykli transportowych do zapisu i analiz. transportu bliskiego

The transport process dimensioning consists in:

- calculating the labour intensity for the transport process,
- determining the information flow time,
- indicating the kind and number of transport means involved in the materials handling,
- determining the number of people necessary to handle the process.

## 6. CONCLUSIONS

The organizational structure of materials handling for the given distribution plant has been presented in a graphical form to show the flow of materials and the transport activities to be performed, such as transport, inspection, anticipation and storage. This diagram has been expanded by a transport cycle chart that determines the basic data necessary for an analysis of the organizational structure, or that defines the time, distance, labour intensity and the technical equipment used.

The elaboration of this subject would be a transport analysis made with the use of the mathematical notation system and a simulation of various solutions, both aimed at finding out an optimal system.

**References**

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