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SECONDARY AND TERTIARY PACKAGING IMPROVEMENT OPPORTUNITIES INTO LOGISTICS PROCESSES

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Abstract:

The paper deals with the secondary and tertiary packaging improvement opportunities into logistics processes. It is extremely important to use the optimal packaging today, in other case the quality of the logistics processes may fail. The purpose of the paper is to analyze the importance of the optimal secondary and tertiary package into logistics processes today as well as way how to use the best secondary and tertiary package for logistics processes. Main branches of investigation are warehousing and road transportation processes. The author investigated the influence of the different types of secondary and tertiary package to these processes efficiency. Indeed, package is important also for other logistics processes. The main solution is: standardization of package's sizes. This allows using vehicles and warehouse's space by optimal way, improving the result of logistics processes. The Research is supported by the National Research Program 5.2. EKOSOC – LV.

Keywords:

Secondary Packaging, Tertiary Packaging, Logistics processes, Efficiency, Improvement

1. INTRODUCTION. THE ROLE OF GOODS PACKAGING INTO LOGISTICS PROCESSES

Either manufacturing companies or trading organizations or logistics enterprises understand the significance of goods packaging for the modern entrepreneurship. Actually, the final customer first of all may see package, not product at once. On the on hand, packaging may influence also primary customer choice, so it is very important for marketing, because package should be attractive and good for the customer. Thus working out the package for goods (especially for luxury and top-quality goods) designers and other specialists. On the other hand, logistics aspects of goods packaging also are very important.

The definition of packaging is "a coordinated system of preparing goods for safe, efficient and cost-effective transport, distribution, storage, retailing, consumption and recovery, reuse or disposal combined with maximising consumer value, sales and hence profit", so there ought not to be any doubt of the importance of this system's view when it comes to packaging design and use [1].

Consumers generally buy products in small quantities. They sometimes make purchase decisions based on product looks and packaging. Retailers are deeply concerned to get products that are easy to handle in logistics terms, don't cost too much to package or handle, yet retain their selling ability on shelves. Secondary and transit packaging can be a cost to the supply chain and is increasingly replaced by returnable handling systems where possible. Unitization is combined with standardization to provide order to the handling of products [2].

Packaging is a means of ensuring safe and efficient delivery of the goods in sound condition to the ultimate consumer, supplemented by efficient reuse of the packaging or recovery and/or disposal of the packaging material at minimum cost' [3].

Many managers of logistics and transport companies (e.g. DHL) suppose, thatpackaging of the goodsis a critical factor in logistics. And the reason is clear: without it, many logistics processes could not be performed at all or could be carried out only at great additional cost. The function of the packaging is not just to protect the product. It performs many other jobs as well. These include providing information about the contents as well as enabling and facilitating other logistics processes – including transport and handling as well as storage, order processing and warehousing [4].

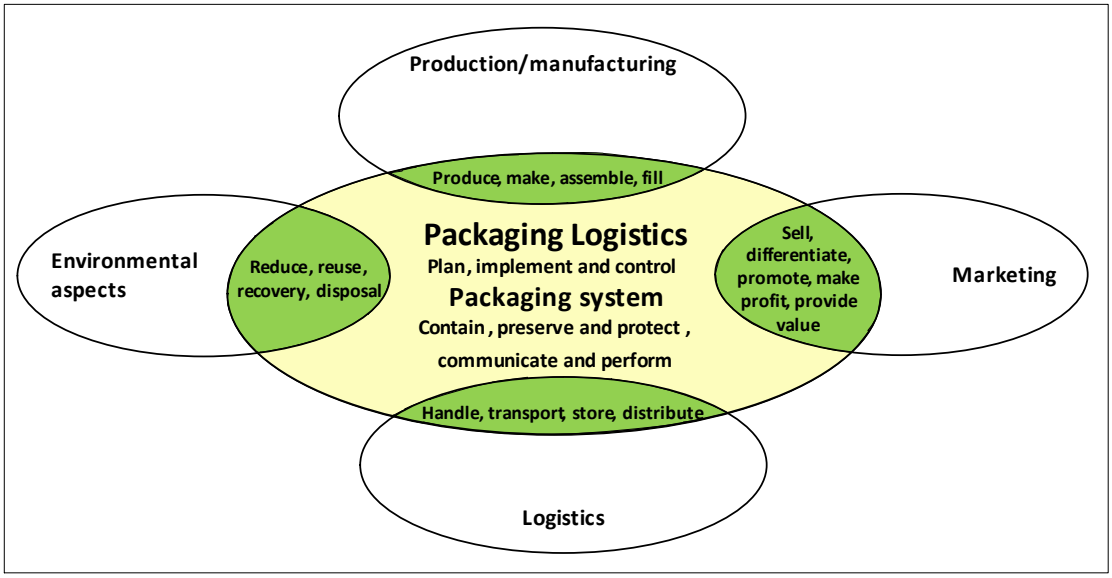

Figure 1 – Packaging logistics relationships [5]

Image 1 illustrates packaging logistics relationships. Certainly, companies have to pay a great attention to manufacturing aspect of packaging, as well as marketing problems, environmental aspects and logistics details.

2. LEVELS AND FUNCTIONS OF GOODS PACKAGE

There are many different classifications of packaging. It is expediently to investigate types of packaging influenced logistics processes and delivery.

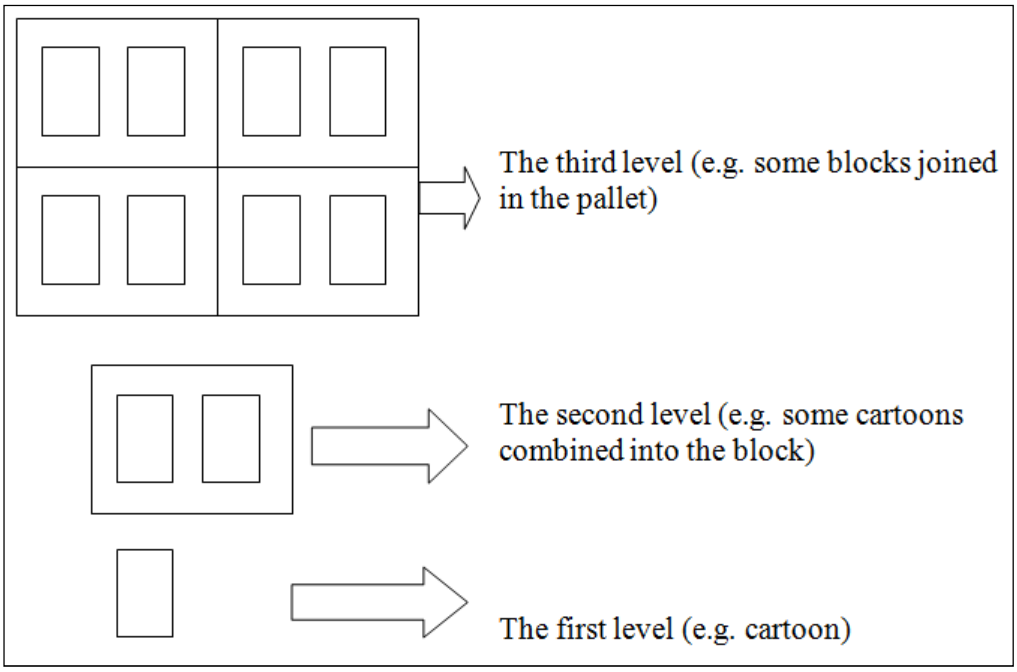

Figure 2 – Levels of good packaging

It is necessary to plan levels of packaging for logistics processes to plan transportation, storage and warehousing as well as other processes (Image 2). Primary packages hold the basic product and are brought home from the shop by the end consumer. Secondary packages, or transport packages, are designed to contain several primary packages. A secondary package could be taken home by the end consumer or be used by retailers as an aid when loading shelves in the store. The third level of packaging, tertiary packages comes into use when a number of primary or secondary packages are assembled as, for example, on a pallet.

Some authors mention following examples of tertiary packaging : stretch films, tension nets or ties for strapping the unit load [6].

There are different logistics functions of the packaging – that is, protection, storage, transport, information and handling.

As a result, the packaging may be regarded only as a part of the entire logistics system. In packaging design, a compromise that addresses all functional areas must be found. The correct design of packaging can help lower overall logistics costs and raise the level of supply and/or delivery service . In addition to the logistics functions, packaging must also fulfill production functions, marketing functions and usage functions. This means:

- through the choice of suitable packaging, it is possible to produce directly from the packaging or into the packaging without intermediary processing procedures.
- packaging can lend a special character to a product, enabling it to be distinguished from the competitors' products. Important functions can also be assigned to packaging, including roles in advertising and sales promotions.
- in light of environmental considerations, it is essential for packaging design to meet these needs. Ideally, the design should make it possible for a customer to recycle the packaging or facilitate its use for other purposes [4].

Packaging is a system for preserving the safety and quality of food products throughout the whole distribution chain to consumer by:

- Maximising shelf life.
- Carrying important information on the label relating to preparation, safety and nutrition.
- Providing evidence that the package is intact and the product has not been tampered with.
- Identifying the date and the location of manufacture for inventory control and identification of potential hazards[7].

So, packaging is very significant logistics support operation.

Despite of the fact that goods' package planning is extremely important problems into logistics processes, a lot of manager do not control this process as well as do not pay enough attention to package planning and design.

The author will analyze the problems connected with the secondary and (mainly) tertiary package.

3. SECONDARY AND TERTIARY PACKAGING IMPROVEMENT OPPORTUNITIES INTO LOGISTICS PROCESSES

3.1. Problem's description

A lot of retailing companies have various problems connecting with secondary and tertiary package into logistics processes. Often the main problem is that package takes too much place, making the transportation process absolutely inefficient and expensive.

The authors analyzed particular companies' deliveries for 2 weeks and assumed information about their package problems into logistics processes as well as made out ways how to solve these problems.

Table 1 gives a random sample of investigated companies' delivery analysis.

Table 1 – Cargo net and gross volume (paper's authors' investigation information)

Number of customers	Cargo net volume m^3	Average cargo net volume per customer, m^3	Average cargo gross volume per customer, m^3	Cargo gross volume, m^3
76	5.19	0.068	0.136	10.336
145	23.11	0.159	0.318	46.11

Pallet capacity useful usage rate may calculate using formula 1:

$$PCU = H \cdot A \cdot \frac{NCV}{CGV} \tag{1}$$

where:
PCU – Pallet capacity useful usage rate;
H – height of cargo, m;
A – area of the pallet, m2;
CNV –cargo net volume, m3;
CGV – cargo gross volume,m3;

The corner-stone problem of various retailing companies is that PCU often takes only around 50% of the CGV. Usually H=1.5 m; A= 1.2*0.8 – 0.96 m2 (euro pallet).As a result, net cargo takes only one half of the total cargo volume. The second half is package (carton of bubble wrap). Very often companies put only some pieces of packaged goods into tertiary package; filled reminding space with carton of bubble wrap.

In this case it is impossible to load net volume cargo 23 m3 into standard 13.8 m lengthtruck.

3.2. Solution. Tertiary package optimization for transportation

Companies have to use additional vehicles as a result transportation costs growth. It is expedient to use standard size cartoons, loading them full to make cheaper transportation process.

Cartoon size 0,4x0,5x0,25 m is quite popular now. It is necessary to fulfill them with product into packaged into primary package, taking into account fact, that often primary package has a shape of ellipse or sphere.

Using this principle, it is possible to use maximally tertiary package space (Table 2).

Table 2 – Package solution using standard-size cartoons

Number of customers	Cargo net volume m^3	Cargo net volume to one customer, m3	Cartoon 0,4x0,5x0,25 m	Number of cartoons to one customer	Cargo gross volume, m^3
76	5.19	0.068	0.05	1.36 (2)	7.6
145	23.11	0.159	0.05	3.18 (4)	29

Analyzing table 1and table 2 information, may conclude that cargo gross volume decreases per 27% for the first variant (76 customers) – from 10.3 m3 to 7.6 m3 and per 37% (from 46.11 m3 to 29 m3). Of course this principle allows reducing of transportation costs too.

The fifth column of the table 2 provides information, that the last cartoon is not fulfilled. (36% and 18% for both variants). In this case it would be expedient to use 2 types of standard cartoons – before mentioned size 0.4x0.5x0.25 m as well as half size of this cartoon.

Theses ways of package optimization allows to reduce also used pallets quantity, saving net volume of cargo, reducing total delivery costs. Table 3 demonstrates pallets quantity decrease for nine deliveries.

Calculating differences between package systems before and after optimization may compute also transportation costs and companies' benefit using optimized packaging system.
Baltic States companies often purchase production from Poland (Warsaw) distributing companies. The table 4 provides information about cargo delivery costs between Warsaw and Riga for different amount of cargo.

Table 3 – Pallets quantity needed for delivery using different package methods (paper's authors' investigation information)

Date	Package system before optimization				Package system after optimization		
	Number of customers	Cargo net volume m^3	Cargo volume on 1 pallet, m^3	Quantity of pallets	Cargo net volume to one customer m^3	Cartoon quantity to each customer, using standard size cartoons	Quantity of pallets
2016.05.29	6	4.11	0.72	6	0.685	14	3
2016.06.01	145	23.11	0.72	33	0.159	4	19
2016.06.17	15	1	0.72	2	0.067	2	1
2016.06.18	76	5.19	0.72	8	0.068	2	5
2016.06.19	1	0.21	0.72	1	0.21	5	1
2016.06.05	7	0.54	0.72	1	0.077	2	1
2016.06.08	59	6.2	0.72	9	0.105	3	6
2016.06.12	179	12.87	0.72	18	0.072	2	12
2016.06.15	4	0.34	0.72	1	0.085	2	1

Table 4 – Delivery costs between Warsaw and Riga for 1–10+ euro pallets (paper's authors' investigation information)

Euro pallets (0.8x1.2m)	1	2	3	4	5	6	7	8	9	10	+1
Delivery Price, EUR	62	97	131	158	172	193	206	240	272	285	15

Investigating information from table 4, may calculate total benefit for transportation and logistics process for companies which use optimized tertiary package system (table 5).

Table 5 – Delivery costs benefit using optimized tertiary package system

Number of customers	**Cargo Net volume, m3**	**Quantity of pallets (Before changes)**	**Delivery costs(EUR)**	**Quantity of pallets (after optimization)**	**Delivery costs(EUR)**	**Differences of delivery costs (EUR)**
6	4.11	6	193	3	131	62
145	23.11	33	630	19	420	210
15	1	2	97	1	62	35
76	5.19	8	240	5	172	68
1	0.21	1	62	1	62	0
7	0.54	1	62	1	62	0
59	6.2	9	272	6	193	79
179	12.87	18	405	12	315	90
4	0.34	1	62	1	62	0
SUM			2023		1479	544

PCU rate may increases from 50% to 80-90%. Total delivery cost in the given example is 2023 EUR before the tertiary package optimization. After the package system change, the costs reduced per 544 EUR and achieved 1474 EUR. The given example investigates period of tome around 2 weeks; so companies benefit per year would be greater (around 15000 EUR).

This approach is quite simple and very useful for real business practice when companies' managers do not pay enough attention to problems connected with cargo secondary or tertiary packaging.

4. CONCLUSION

Despite of the fact that goods' package planning is extremely important problems into logistics processes, a lot of manager do not control this process as well as do not pay enough attention to package planning and design.

Packaging problem is especially difficult for goods with special shape of primary package. In this case special approaches needed to optimize tertiary packaging and improve logistics process. Control and optimization of tertiary package allows improving of the logistics process as well as providing of benefit to companies, reducing transportation and logistics costs.

It is expedient to use standard-size cartoons for tertiary package optimization. Companies have to choose 1 or 2 most suitable size of cartoons and use it to serve customers by optimal way, simultaneously reducing transportation costs.

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