

## RETURNABLE CONTAINERS USED IN THE AUTOMOTIVE INDUSTRY

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**Abstract:**

*This paper is focused on the returnable containers used in the automotive industry. The paper presents basic types of returnable containers, their storage and circulation in a society, which is the part of the supply chain in the automotive industry.*

**Key words:** *returnable packaging, storage, circulation of packaging*

### 1 INTRODUCTION

Packaging belongs clearly and inseparably to the logistics. Only through the pack, the product becomes capable of transport, storage and handling. The packaging can be considered as an article that combines the production process, storage and distribution [1]. Proper evaluation of packaging in logistics is a cost saving source and contributes to a distribution service improvement. Packages allow rational handling, they are part of the logistics transport system, manipulation, storage, and also an important source of information for each participant in the process of circulation. Packaging is an activity consisting of product preparation for circulation and consumption through packaging and at the same time it is a functional connection with a product packaging. Properly selected packaging helps to reduce logistics costs, precisely because of its optimal size and its adaptation to the handling, transport and storage equipment.

In recent years, increased attention is paid to the packaging. Particularly in terms of ecology and high incidence of packaging waste in order to focus on materials that can replace the consumption of natural resources during their production. The aim is to achieve packaging recovery and their re-use with the most economic impact on the environment.

Goods circulation upheaval was caused by costs units and a modular packaging system. The classic example are pallet units that unite packaging, storage, transportation resources, equipment and organization into a unified system.

A demand for a corresponding modular system results from the fact that different organizations cooperate in the transport chain and there are different packaging types at different levels of packaging. There were several suggestions to design a united solution for building blocks, known as the modular packaging.

Finally, it has been determined that the storage module has a size of 400 x 600 mm, by multiplication and division of which the entire system of modular packages for optimal storage space utilization is formed [1].

## **2 RETURNABLE PACKAGING IN THE AUTOMOTIVE INDUSTRY**

The automotive industry as the fastest growing industry for individual components handling, applies returnable packaging on a regular basis. Returnable packaging is used in the automotive industry to transport components, e.g. from suppliers to assembly lines or directly to vehicle manufacturers.

Returnable packaging is used as boxes in which components are moved from the warehouse into the production hall, for a so-called internal flow.

In connection with plastic pallets and a pallet cover (the lid), returnable packaging (boxes) forms an integrated transport unit. Standardized plastic boxes can be stored on a standard plastic or wooden pallets and be covered with a standardized cover (the lid) in a particular dimension. This will create an integrated pallet handling unit that can be stacked, and thus save space in the warehouse, the vehicle, etc.

The automotive industry takes care not to produce packaging waste in its chain and therefore the returnable packaging is used, which is suitable for transportation of components and handling of components.

Manufacturers often get into a situation where the supplier and the owner of boxes fails to deliver boxes in due time or in the required quantity. In such cases the production must be immediately redirected into an alternative packaging.






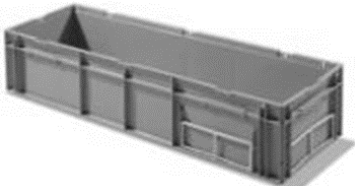
An alternative packaging is mostly contracted during the project phase, before the start of the final production process, in order to avoid a situation when the absence of returnable packaging causes shutting down of the entire production process. Proper timing and sufficient supplies of returnable packaging prevents from production lines shutdown and the supply of components to automotive factories is not jeopardised. The validation of such alternative packaging is subject to the quality requirements and the alternative packaging must be adapted to the standard box, the same way as the returnable packaging. If, for example, there are different dividers (trays) in returnable containers, the alternative packaging must also be equipped with such separators, as these boxes are inserted into fully automated production lines in the automotive factory.

For some customers, an alternative packaging cannot be used, either because of qualitative reasons or due to the fact that the components are prone to dusty environment and from such cartons various elements of dust or dirt can release.

If there is no alternative packaging approved and the warehouse does not have required boxes, the production process will stop. The lines are designed for the production of more components. In case of the absence of the packaging, the production lines can adapt to other component production within minutes, and thus only the production of the component and not the entire manufacturing process is shut down. It changes only employees' operation [2].

### 3 RETURNABLE PACKAGING WITHIN THE COMPANY

The company uses several types of returnable packaging - plastic boxes, according to customer requirements. The most commonly used are the boxes, which are known as EURO STD (euro standard). There exist special boxes in various colours. Figure 1 shows selected types of returnable packaging, its sizes and pallet dimensions. Into selected boxes there are inserted tailor made dividers (trays) in which individual components are stored. One box may also include several dividers (trays), and if components are stored in dividers (trays), individual surfaces do not touch components in other dividers (trays) next or below it. Examples of dividers (trays) are shown in Figure 2.

<p>GefBox 6422: dimensions 600 x 400 x 220 mm</p> 	<p>GefBox 4312: dimensions 400 x 300 x 120 mm</p> 
<p>GefBox 4322: dimensions 400 X 300 x 220 mm</p> 	<p>PCA 64207: dimensions 600 x 400 x 270 mm</p> 
<p>BAC-O-4325: dimensions 400 x 300 x 235 mm</p> 	<p>BAC-O-1322: dimensions 1000 x 300 x 220 mm</p> 

**Fig. 1** Selected types of returnable packaging

The company has the returnable packaging, which it has in its possession, further the packaging provided by the customer, and some packaging is leased from other companies that supply other automotive plants with their boxes.

Owners of packaging have to check the trays and boxes, and in case of any damage it is necessary to replace them with new ones. It is not only expensive, but it can endanger the production process and the cycle (loop) of reusable packaging. Returnable packaging is delivered to the empties warehouse. In respect of a returnable container owned by the production company, the boxes are moved to the production to the respective production lines, as required, or sent in the first phase to the supplier manufacturing components for the company.

Packaging for the production is firstly visually checked if it is clean, undamaged, and the last labels, if any, from the previous production are removed from them. This procedure is described by an internal general instruction, according to which all employees must follow this procedure.

After a visual inspection of the boxes and possible replacement, the boxes are prepared on the so-called rollers and subsequently they are placed in the zones determined for such box. Boxes placed in a respective zone are ready to be supplied on production line, the linefeeder brings them to the production line. Each production line is specific in terms of a type of the box. In other words, if the production line has a defined box of a certain type, the box of any other type cannot be used as the production line firstly weights the box, and it immediately refuses the box and displays error.



*Fig. 2 Example of packaging with trays*

During the production process, components are inserted into boxes manually or automatically by a robot. The boxes filled with produced components are placed into a dispatch area in special zones prior determined for each customer.

The boxes with produced components are placed into a packing zone, packed according to a prearranged rule and placed into an export area determined for the specified transport. The process is described by a general rule which must be followed by all the employees in the export zone. On the basis of a distribution plan, the components are delivered to final customers.

After the components consumption on customer's side, empty boxes are moved to the empties warehouse, and after that the owner of the boxes is informed about the amount of boxes in the supplier's warehouse. The boxes are picked from the supplier and delivered back to the production plant and returned back to the loop for next production.

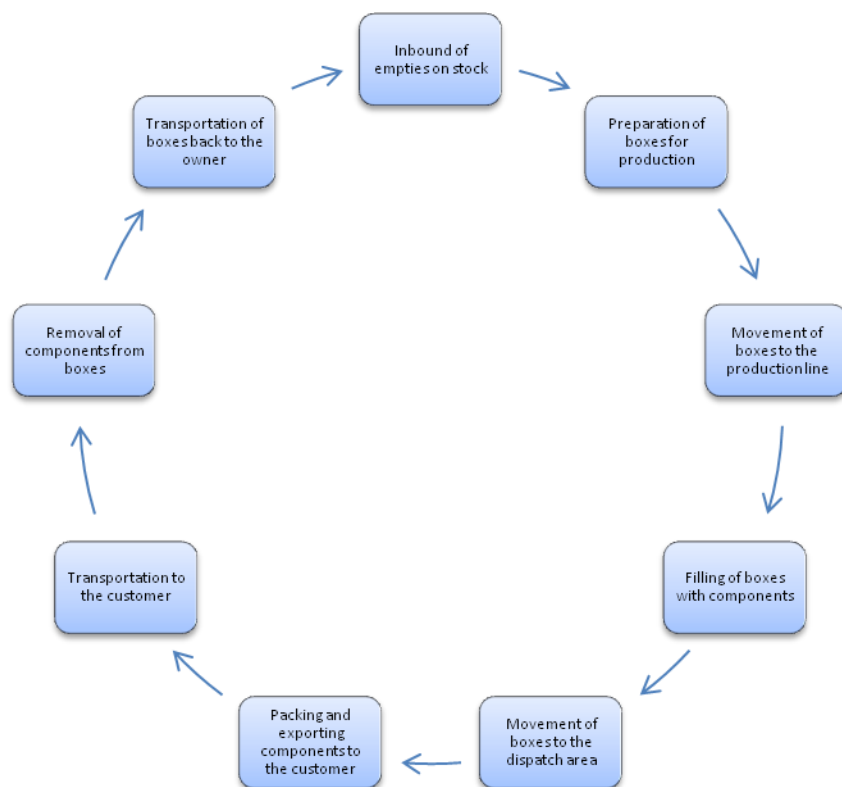
Packaging in the ownership of the customer is continuously supplied to the production plant on the basis of production capacities. The delivery of the boxes in sufficient quantity is provided by the customer through its contractor, or the owner of returnable packaging. Weekly average consumption of returnable packaging ranges between 25,000 and 28,000 pcs of boxes.

### **3.1 Storage of returnable packaging**

Returnable packaging is stored on pallets, which are stacked (see fig. 4). Stacking of returnables saves place in the warehouse, there is also a clear overview of the amount of packaging when pallets with different kind of packaging are not mixed. Most of the box types are different so this could prevent from changing of the boxes for the specified production line. A warehouse for returnable packaging is designed to get packages as quickly as possible to the production line. The best conditions for such kind of a warehouse is that the roof is covered instead of storing boxes outside. If a warehouse does not have enough space for

storing inside, each company has to decide which kind of boxes can be stored outside in order to avoid production line stoppage.

In the picture, we can see boxes stored outside, it is in conjunction with conditions for production lines. The boxes must arrive in the production line clean, dry and without any dust or dirt. Storing of boxes under the roof is a necessity for each company. As mentioned above, a high priority in automotive sector is to have clean boxes in the production line to avoid any stoppage or shortage of returnable packaging.



**Fig. 3.** Loop of the packaging in the ownership of the production plant



**Fig. 4** Warehouse of returnable packaging

### 3.2 Options of increase in the storage capacity to have a covered warehouse for returnable

Increase in the storage capacity can be done by e.g.: enlarging of the existing warehouse if there is enough space, extending of the roof construction, or purchasing of a mobile hall or and industrial tent.

Enlarging of the existing warehouse may require a high investment and long time for projects and implementation. In addition, it is necessary to move all the electrification, waste, etc. Then it is necessary to store the returnable packaging on a temporary basis in any other facility until the warehouse is enlarged. During the warehouse enlarging, the costs might increase due to storage of boxes out of own warehouse space, the production might be limited if the boxes fail to arrive on time.

Another solution to increase the warehouse space is to purchase and build an industrial tent or a mobile hall (see figure 5 as an example). Tents can be effectively used as a temporary or long term solution. As the tent is covered, any heavy pollution of any stored goods inside can be avoided.



*Fig. 5 Industrial storage tent*

Mobile warehouses or industrial tents have several advantages [3,4]:

- Quick and easy to build and use,
- Possibility of placing windows, doors, as required,
- Several variants of casing,
- Individual equipment (heating, air-conditioning, lighting...).

Tents and mobile warehouses can be purchased or rented on a long-term basis. The following table shows a breakdown of the costs for a tent of 525 m<sup>2</sup> in case of its rental and purchase.

**Tab. 1** Investment in warehouse enlarging

Possibility	Lease / year	Insurance / year	One time investment	TOTAL
A. Short term lease (12 months)	8 420 €	2 160 €	15 170 €	35 750 €
B. Mid-term lease (24 months)	15 084 €	2 160 €	15 170 €	49 572 €
C. Long term lease (36 months)	14 352 €	2 160 €	15 170 €	64 706 €
In case of purchase	-	2 160 €	59 300 €	59 300 €

## 4 CONCLUSIONS

Some suppliers of returnable boxes, being also the customers of the production company, do not insist on storing returnable containers under covered areas, but they require delivery of components in clean containers, otherwise they immediately complain about the fact that the company does not respect the agreed terms and conditions of services.

When choosing a final option to increase the storage space and protection against pollution of returnable packaging, it can be realized on the basis of a multi-criteria assessment, which belongs to the comprehensive evaluation methods aiming to minimize the degree of subjectivity in choosing the appropriate option [5].

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