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Analysing the functions and expenses of logistics packaging

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Two main types of the packaging systems can be distinguished in the logistic supply chains, depending on which roads the packaging spreads according to their function and their role like a device or product. Today by means of their system-organization and continuous development, the companies get into a decision dependence situation in order to getting the optimal logistic-packaging expenses. This decision situation practically means the decision mechanism between packaging systems one-way and reuseable packaging (disposable, or returnable). The study examines the theoretical function processes between these two systems, and the expense-structure which is belonging to a given systems furthermore.

Keywords: logistic, packaging, structure

JEL Codes: P40

Motto: „The decision of what kind of packaging structure we should select only can be expedient with a system-based analysis" (Böröcz Péter János)

1 Introduction

In the past 15-20 years the cost effectiveness has received a significant role in the practice of the corporate activity. At the field of logistic packagings (let it be industrial-transportation, or even consumer packaging) the companies get into decesion dependence in order to determine the optimal packaging expenses technically. This decision situation practically means the one-way and reuseable (disposable, ill. returnable) decision mechanism between packaging systems. Although more international studies deal with the difference between these two systems and there unique peculiarities in detail, unfortunately only industrial branch useful analyses are provided [1] [2]. We cannot face models accepted universally. This study survey the theoretical function processes between these two systems, an expense structure which belonging to the given systems furthermore.

The decision that which system we should not select at all does not provide us a primary or definitive solution, but it means pressure practice to operative specialists all the more much. The detailed analysis of the single alternative opportunities has become their task

in order to organise the suitable operating for the corporate requirements between frameworks.

Onto the making of equivalent decision we have to set up a requirement system, which is suitable to let us decide on the question of the adaptability between the two systems. Shortly according to the undermentioned viewpoints itn can be summed up that which content requirements we have to pay attention for (not mentioned the quantitative indicators):

a) further development potentials of present common systems (participation opportunity in actual protocols);
b) opportunity to harmonize or standardize with the new system;
c) choosing the adequate device, technically;
d) the logistical and its organizational tasks of the device;
e) management, sortment and cleaning tasks of returnable devices;

Environmental regulations of the last few years increased the importance of the development of packaging systems, and this way also the decision making between systems. Namely, it would be vital for the environment, to increase the reuse of packaging or its recycling and this way decrease harmful environmental effects. These state regulations [3] also are the generators for R+D+I activity in the logistics packaging systems, all the aspects of technical-technology and organizational process.

Unfortunately the companies in the industrial practice have hardly enough informational bases to introduce an optimal packaging system. We can observe that the one-way (mostly be a recycledable materials as well) devices and his priority in a corporate packaging systems is continuous rising [4]. In accordance with this naturally the specialists are watching an absolute irregular headway of returnable systems with an interested eye only [5]. This may be the reason that the companies have sketches only quasi from the requirement system of the introduction of the various packaging systems. These schematic informations do not serve in this way full hypotenuse picture from the theoretical and organizational structure of the convertibility of the processes.

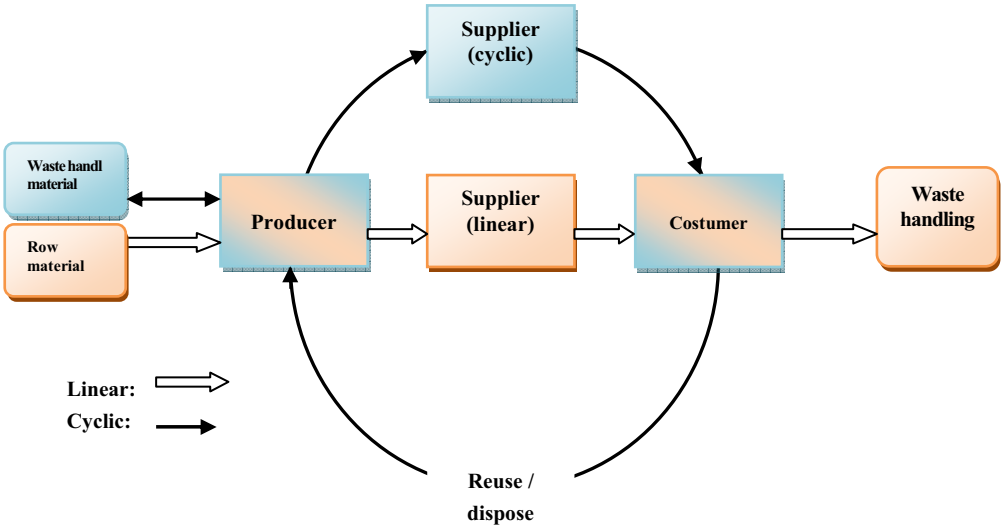
The environmental protection limitations, mentioned early, will increase the usage of expenses of the not returnable and not recycledable devices. It is predictable, that increasingly more corporate will be interested in the immediate future in the application of reusable devices like a more costeffectivness packaging systems.

2 Theoretic structure - general

In the logistic systems two packaging systems can be differentiable (Figure 1.) which depend on which roads the packaging spreads with his function according to his role like a product in a given supply chain. This chain when the packaging devices are sent by his manufacturer or his distributor. Practically the packaging appears as a waste already, because the enduser handles it like a waste. I call this process-direction like the *linear packaging structure* on the figure below.

This linear structure can be replaced with a system, in which the reusing of the device extends the life cycle of its supply processes. This is the *cyclic packaging structure*, which can be a significantly different form the above mentioned, because the manufacturer of the device or the first user (supplier) is the responsible for handling the devices as a waste or recycling.

Figure 1
The theoretic structure of packaging systems



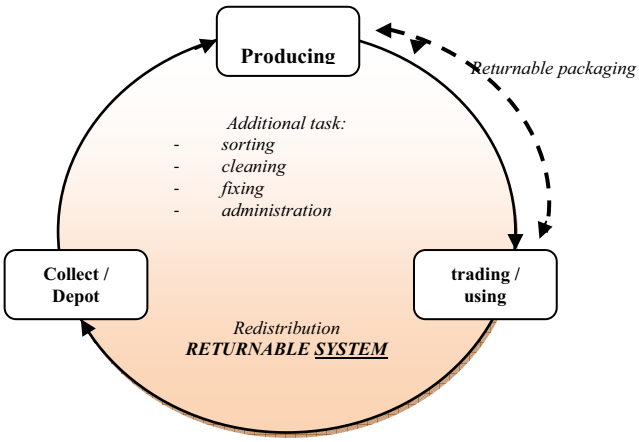
In the final it is necessary to examine the packaging system types according to different viewpoints. We have to do an analysis setting out from the existed systems, and it is necessary to do the suitable comments with the respect of the prescribed requirements and structural rules. We cannot do the omission of fundamental functions, for example the defensive one, logistic and communication-merketing functions. But a detailed analyse has to include the new requirement system of the modern systems, than the recycling, waste treatment, concerned system maintenance management expenses.

I have to call the attention that we do not have to choose between one-way or returnable packaging, but between packaging systems, with their all advantages and disadvantages.

3 The appearance form of returnable packaging

We can see on the Figure 1 a simplified conceptual structure of the single systems which can be relatively easily grantable. This system is not getting complicated further in case of the application of one-way devices. At the same time by the cyclic system we have got to face more form of appearance. The reason is that the number of the characters of the system grows or the operating of the system has got surplus tasks. It can be seen on the Figure 2, when we can observe the indirect return of the device, with a so-called depot's insertion.

Figure 2
Organization of the returnable packaging in a system



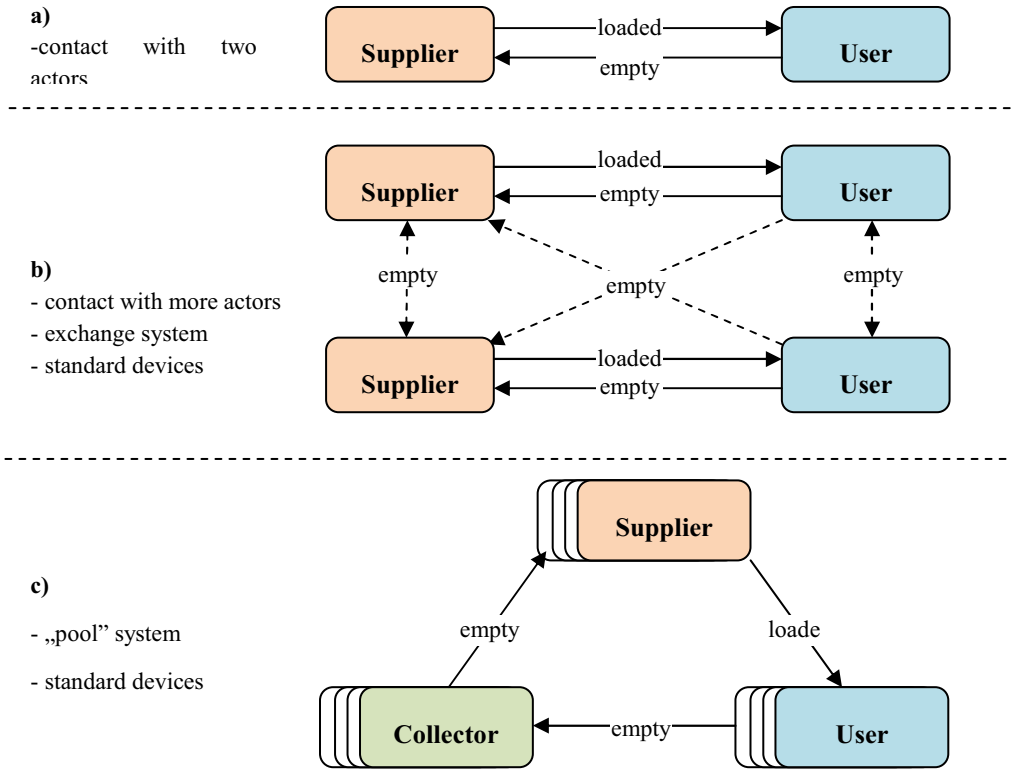
Altough we have got to face several of forms of the appearance of returnable devices in the practice, after all their function can be built up the same conceptual structure. This system can be complicatied already only with forms, in which the characters' number are on a given level (using/trading/collection levels) multiplies. This is visible on the undermentioned Figure 3.

We can see on the figure that the type of the devices influence the measure of the possible level of organization. The organization of the returnable packaging with a higher degree already only exclusively standardised device can be imagined.

The “pooling” system (a repeatedly rental opportunity of packaging with standard devices) (Figure 3.c), in this case the user takes advantage of a rental service as the alternative of the purchasing of returnable packaging/using. With the usage of the system on one hand we can able to reduce fixed asset, on the other hand it is possible to repair the efficiency of the logistic packaging process with filtering out the single hidden expenses, which has got a direct effect on the packaging total costs. The theoretic structure mechanism of a single exchange system and the pooling system I will not deal with because of extent reasons.

Figure 3.

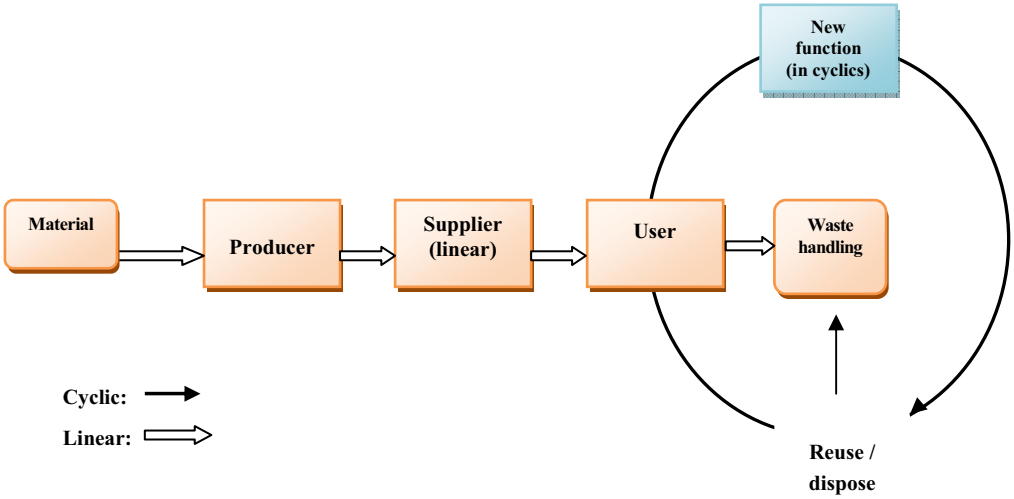
Organisation levels of returnable system



Source: Dubiel [6], 1996

It is necessary to complement the above ones with a thought yet. Although in practice the detailed analyses should be preceded by the decision of the packaging systems [7]. The single characters of a chain do not initiate a common negotiation in the numerous cases after all. The adjacent elements of the chain interpret the usage of the system as something else. We can find some situation like the one-way device is put to use as a reutrnable device, even with the other function's role. This yields the result that the antecedent analyses are the parameters of input already naturally not sufficient factors, which bring us usefulness expected result. We can meet often these systems with the peculiarity of inside in the industrial sphere after all, although the train of thought has significance on the space of the consumer packagings primarily.

Figure 4
Organization of a one-way device in a returnable system



The early mentioned linear system turns into a cyclic system easily in this way (Figure 4.), without all antecedent formal reasons. The level of the tactical decisions does not effect onto this phenomenon already, but the daily practical specialist who dealing with the operative solutions. This task becomes important when the suitable feedbacks and checkpoints are claimed by the possible decision criteria and alternatives int he course of a decision process.

4 The cost like the main factor of building decision alternatives

The distinctness of these systems is so important, because the form of appearance of the expenses can be essential different. So the adequate application of the system will not be suitable for a comparison at all.

The three phasis of the decision mechanism could be determined with the followings:

- identify of the rising pakcagong costs;
- determine of the direct packaging costs;
- allocation of the pakcaging costs.

The corporate experiences indicate that unfortunately not enough information is standing for a provision for the expenses of the used packaging. It can be experienced because the packaging is handled as a neglected area, even inside the logistics. On the other hand there will be an emphasized of importance question if the product-harms are happened by the packaging. But mostly this makes only the redesign of sufficient packaging technically. The redesign of the packaging expenses is never a task really emphasized. This is a problem because of the later packaging claim determines the final expense. If we deal with the forming of the packaging device and system in the phase of the product planning, then we

could configure some feedback mechanisms possible onto the product planning processes. Respects of the above corporates are instincted by the European Union governing principle of regulation dealing with packaging [8].

In the latter years the companies have not already executed only the analyses concerning material costs strictly, but also the recycling, making harmless and for other expenses. But the most important problems stays outside, that which packaging expense causes the bigger part of the total expense and how will increase in the later processes. Contradictions like this, which hold back the detailed cost analysis and cost comparison:

- incomplete knowledge of the packaging expenses;
- the limitation of costs of the packaging material, labour and waste handling;
- the deficiency of knowledge, which is necessary to the analysis of the packaging expenses;
- the bigger part of the packaging expense are coming from the company's or a product's character;
- because of lack of information the degree of an incentive limited recognition ability.

We need order the type of expenes in group to decide that those occur or not. In the later Table 1 the expenses naturally are not full, because there has to be compplemented by corporate special claims in a concrete case. After all it is suitable to let us be capable finding the most important parameters of the full cost. The table does not contain any information about the absolute measure of the expenses, not too his aim. The particular circumstances decide this in all cases.

This qualitative partition is suitable for us to develop the suitable quantitative features on the circumscribed expense areas already. This can be a basis already for the alternative decision process between the systems. Naturally in that case, when only and exclusively the costwearing is the main viewpoint.

For instance:

- *Datas of device*: geometrical sizes (height * width * lenght) [mm], mass [kg];
- *Data of packaging*: geometrical sizes (height * width * lenght), weigth: [kg];
- *Lifeperiod ofrReturnable / one-way device*: [year], [number of cyclic], [period of a cyclic];
- *Number and quantity of necessary packaging*: [piece], [kg], [m^2], number of devices [piece/palet], mass of full filled pacaging [kg;] sizes of loading unit [mm];
- *Data of forwarding and transport:* number of loading units [piece/carriage], [piece/year], distance of return [km], number of devices on a palet [piece/palet], mass of loading unit [kg], fullm mass for transport [kg];
- *Data for producing*: activity output [product/time], number of packaging [piece];
- *Data for storage:* number of loading units [piece], period of the return of the device [day], number of empty packaging [piece];
- *Data for waste handling:* types [kg/year]

Table 1
Cost-strucutre of pakcaging system

Type of cost	*Returnable - cyclic*	*One-way - linear*	*Appearance*
Material cst - cost of packaging material - cost of packaging accessories			- one-way, HUF/piece - returnable HUF/piece - others HUF/piece
Cost of equipments and machines - loss of value, interest of capital asset - energy cost, operation cost			- HUF/kW/hour, HUF/GJ
Cost of forwarding - loss of value, interest of capital asset - cost of labour - energy cost, freight			- HUF/round - HUF/km
Cost of storage - loss of value, capital for storage - cost of storage-tenant - energy- and operation-cost			- HUF/m^2/day - HUF/palet/day
Cost of handling - cost of labour in pacgaing process			- HUF/month
Derivable cost - cost of repair - cost of inventory shortage - cost of refuse product			- HUF/piece
Cost of waste dispose - costs of collection and sortment - cost of recycling - cost of destruction			- HUF/kg
Additional cost of returnable device - interest of capital asset - cost of return, deposit fee - cost of cleaning, cost of repair			- HUF/piece - HUF/km/piece
Other cost of returnable device - costs of management and administration - cost of damages - cost of insurance			- HUF/month - HUF/piece

In this measures the pool system can be also substituted, or we can substitue the one-way device as well which can use like a returnable one. The reason is that these systems have got similar parameters in this cost field.

5 Cost-structures of one-way and returnable systems

To understand the cost structure of a linear system can go easily and while the cyclic system is complicated. But from practical viewpoint to understand the returnable system lead to a better result. Even if you have to turn away from the emotional and practical customs, and have to calculate some complicated theoretical models. The source of the mistake is mostly the using of previous practical data, which cannot give an accurate result even approximately in most cases. In this way the comparison give false result because of the processed incomplete informations and expenses.

The grouped expenses contain resultant expenses, which can separate according to the peculiarities of these two systems. Furthermore a rationality potential appear in this way, which is neglected often in the corporate practices.

In case of both systems the following state is valid, that the standardised devices simplify directly the full logistic process, but has an effect on the establishment of the expenses. In this context this means that the continous developed structures and organizational processes can save expenses. This can play a real role in the course of the direct comparison of the systems.

The main difference of the linear and cyclic system is that the characters of the logistic chains have to reckon with different expenses. Since in the cyclic system the enduser can use the device in much case and can reckon with expenses occurring to the process of the time steadily practically. Till in the course of the linear structure the expense cannot be returned. These expenses in space can be marked off, even some we take the company's physical borders into consideration. In case of the cyclic system at the same time the product responsibility exist undependently from the position in space. We can mention here that the recurrence, making harmless, recycling, etc. requirements, have significant different in the both cases. The practical experiences indicate that these expenses are always underestimated significantly yet in case of the application of the linear systems.

The management and administrative expenses depend on the unique peculiarities of the systems primarily. Diverse solutions exist in the function of the technological and technical variations. The measure of them can be exceptionally considerable; negligence of them causes considerable distortion in the course of a calculation.

In the linear system the expenses of the recycling and waste placement are conspicuously taller, than in the cyclic system. Thought, that the devices which can be used many times would have an unlimitted lifetime, would be irresponsibility at the same time. It is necessary to pay attention that these expenses which ones the mostly inclined onto the decision. These expenses can be able to decrease the profit in the function of the quantity.

The returns play an important role in the cyclic system as well. However the financial effect of its is examined easier in the aspect of organizational, logistical and technical. It is necessary to lay a strange emphasis on the solution of the next problems hereby.

- range of wares can be handled together;
- utilization of the carriage;
- accordance of combination of different packaging;
- application of smaller in space packaging (collapsible returnable packaging);
- application of standardized and modularized devices.

The advantage of the cyclic system is, that in the function of the number of the usages can save signifikant costs, altough it demands an onetime capital binding. The usage period and number of usage can be a main factor when we have to decide between the two systems.

Finally I have to mention two problems yet. On the one hand the packaging-development and expense-development can be based on vague factors, on the other hand the expenses of management and administrative can be analysed so difficultly, mainly in a multinational company's enormous organizational hierarchy.

The definition of the expense headings and types of expense are not compatible with general solution of the other system in a parallel way. In the course of the preliminary calculations and decision mechanism it is necessary to take the structure changes into consideration.

6 Conclusion

In two systems the individuals' cost level can be influenced significantly by the cost wearing inclination of the elements of chains. The practical experiences show that the argument in an individual preferencies cannot give adequate results in the course of introduction of a system with optimal costs. The key of efficiency for building up a structure and exchanging a system must be laid on a common decision policy of the participant. To solve this problem we need examine the characters' behaviour.

However, we do not need forget that the establishment of the expenses in time is not being constant, so it is necessary to verify experiental results continuously. We can experience because of this that most companies periodically return to thw problem of the change of the packaging system.

It is necessary to observe here that the maintenance of a linear and a cyclic systems beside each other gives a difficult harmonic operational. The wide range of the substanced materials and products permute lot of problems at a special field of a company dealing with operative logistic.

A planned structurechanges has to be lied on a detailed plans independently builing up from a linear or a cyclic system. This is the only way to be successful structures with cost effectiveness in a decesion centre logistic process.

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