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## UTILIZATION COMPOSITION OF PACKAGING-TRANSFORMER "CONVENIENT PACKAGING" FOR CONCEPT OF "CONVENIENT FOOD"

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The concept of "CONVENIENT FOOD" involves simplifying the daily food consumption of the average consumer on the basis of characteristic features. One of them is the "CONVENIENT PACKAGING" packaging product, the concept of which involves not only a thorough choice of material according to specific functional requirements, but also a review of the attitude of a very uncomfortable, for some reason, issue - the ability and utility for the consumer of recycling. Since the existing requirements for sorting, collecting, preparing, moving, processing and packing residues do not avoid the need for landfill sites. On the basis of increasing legislative requirements for waste disposal, the direction of searching for means of increasing the efficiency of the use and processing of packaging products contributes to the emergence of an independent high-tech industry. A characteristic feature is the purposeful work of researchers and engineers in two opposing directions - the saturation of the production technology while facilitating the processing technology. In the opinion of the author, it is advisable to look at the landfills of Ukraine in a fundamentally different way - to interest the consumer, the processor, the packer. In addition, as a mediator, on a commercial basis, a system of mobile harvesting and processing facilities for sorting garbage for processing plants and self-rigorous heat treatment. Thus, the proposal to change the perceptions regarding the organization of household waste processing will allow not only to resolve the issue of existing landfills by destroying previously buried products such as "Tetra Pak", as well as developing the packaging product "transformer" "CONVENIENT PACKAGING" to take into account the convenience of utilization. But it requires the creation of a fundamentally new specialized equipment for heat treatment.

**Key words:** convenient packaging, heat treatment, convenient utilization.

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### *Introduction*

The concept of "CONVENIENT FOOD" [1] involves simplifying the everyday food consumption of the average consumer on the basis of characteristic features. One of these is the "CONVENIENT PACKAGING" packaging product [2, 3], the draft concept of which involves not only a thorough choice of material according to specific functional requirements, but also a review of the relation for a very uncomfortable, for some reason, issue - the ability and utility for the consumer of recycling. Since the existing requirements for sorting, collecting, preparing, moving, processing and packing residues do not avoid the need for landfill sites.

### *Presenting main material*

The industry of packaging and packaging products is dynamic and highly competitive, therefore

its producers pay attention to providing the consumer with increased convenience of use and a longer shelf life of the product at a lower cost [2 - 8], which (Fig. 1) reproduce the following modern trends.

*Direction for material replacement.* Recently, the proportion between packing materials (glass: metal: paper: plastic) varies considerably. The most noticeable is the transition from glass and metal to plastic, even if there are a number of legislative bans. Sidel Company (Fig. 1a) has created a PET bottle, which is suitable for pasteurization, that is capable of not only filling with beer, but thanks to the possibility of using crown caps outwardly resembling beer in a glass bottle. In this case, the bottle weighs only 28 g, which is only 14% of the weight of the same volume (330 ml.) of a conventional glass bottle.

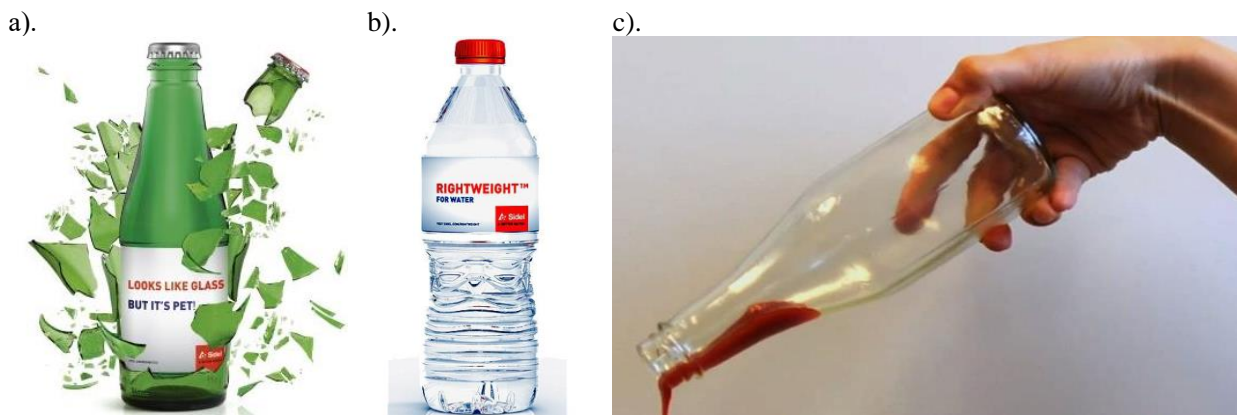


Fig. 1 General view of PET bottles: a - companies "Sidel"; b - the company "Sidel Right Weight"; c - company "MIT"

*Direction for product weigh reduction.* It is when it is believed that the minimum weight is achieved, the industry provides a new level. New Sidel Right Weight PET bottles for carbonated beverages with a volume of 500 ml. (Fig. 1, b) weighs 7,9 g, although the usual bottle today weighs 12 g, but somewhere 30 ... 40 years ago, the bottle of the same destination weighed as much as 28 g.

*Direction for reduction of residues.* In addition to the desire to reduce the use of packaging raw materials, the study of the possibility of reducing food waste in an empty bottle may be equally interesting. The company "MIT" offers a two-layer inner coating of bottles (Fig. 1, c) - porous solid and impregnating liquid, which is constantly damp. The bottle remains clean even after use for ketchup or mayonnaise.

*Direction on bio-regenerative resources.* The last time is gaining popularity in the direction of more thorough use and distribution of assortment of packaging products based on biopolymerous plastics. Bioethelene catalytic dehydration of bioethanol (fermentation product of carbohydrates) followed by normal polymerization to produce polyethylene (PE). It is not a biological process and has the same properties, processing and performance as PEs from natural gas or petroleum raw materials. The main producers are in Brazil - using cane sugar as input material (Danone yoghurt cups, Odwalla bottles, caps and fasteners to Tetra Pak boxes, Coca-Cola bottles). All parts of the product, including caps, must be made using only biodegradable materials "so that they are properly recycled.

*Direction on biodegradable resources.* For the media, biodegradation of packaging materials is the most popular trend among the general public. Biodegradable products are associated with "natural quality", that is, what nature does, which means that by default this should be good! It is these products that can

solve the problem of solid waste - the garbage can compost. But few people think about the organizational and technical complexities and the environmental consequences - the need to increase the number of land plots for landfills and landfills.

*Direction for recycling garbage.* Provides collection, transportation and sorting of waste by certain groups at a waste recycling company or consumer (Fig. 2).

The use of landfills has deep historical roots - a forced, temporary solution to a problem that is in principle contrary to environmental and resource requirements. As landfills are increasingly moving away from cities, and the area for garbage can not be infinitely increased, the problem of their industrial processing is relevant to all countries. More than that, such processing takes into account the requirements of ecology, resource conservation and economics: thermal treatment (mainly combustion); biotermic aerobic composting (with biofuel production); anaerobic fermentation (with biogas production); sorting (extraction of components for secondary use, harmful components, separate groups, most suitable for technically, ecologically and economically for processing); thermomechanical processing (with the receipt of granules that are capable of use under the original purpose). Recycling is one of the most rapidly developing industries in modern Japan. Germany is an example of a country that has been able to escape the inevitable garbage collapse for 25 years and has come to the system of sorting and recycling 95 % of waste. An example for Ukraine, which has huge overflow polygons and landfills in the absence of a consumer culture for the separate disposal of waste on the brink of an ecological catastrophe.

*Direction for burning garbage.* Sweden - recycling 99 % of garbage and importing more than 700 thousand tons of waste. There are 30 power plants processing the waste. The remaining ash is 15 % of the original waste weight, sorted and again sent for

recycling. The residue is sifted to extract gravel used in road construction. Only 1 % of waste is thrown into landfill. Smoke from waste incineration plants consists of 99.9 % non-toxic carbon dioxide and water, which is

filtered through a dry filter and water - the filter slag is used to fill the abandoned mines. Garbage is imported for fueling the power plants that heat up 20 % of buildings.



Fig. 2 Visualization of garbage in certain groups for the consumer of packaging products

On the basis of increasing legislative requirements for waste disposal, the direction of searching for means of increasing the efficiency of the use and processing of packaging products contributes to the emergence of an independent high-tech industry. A characteristic feature is the purposeful work of researchers and engineers in two opposing directions - *the saturation of the production technology while facilitating the processing technology.*

The suggestion [9] of "Aachen htp" for the special printing ink sensors, which simultaneously provides information: a visual consumer relative to the product and a digital processor in the automated sorting of trash can be rather indicative.

This is all the more urgent that even with the change in the relation of individual Ukrainians to garbage and the establishment of a system of primary sorting in the form of a separate disposal of waste, at least inhabitants of high-rise buildings. But still sorting questions will remain, since it is difficult for a single average consumer to accept generally human ecological aspirations. It seems that the existing approach to packaging products, its producers and processors, in turn, consider it useful to transfer organizational and technical problems to a consumer who, even at the legislative level, is their silent hostage.

The consumer of a food product in a packaging product is compelled to pay for, if only occasionally, the choice of the raw materials (glass, metal, plastic, paper, organic), to pay:

- research and marketing works on the trends of packaging industry development;

- obtaining of natural and artificial raw materials, its processing and production of materials;
- preparation of materials and production of certain packaging products;
- Marketing measures for research and imposition of products for the product manufacturer;
- preparation of packaging and packaging products;
- warehousing, storage and distribution of product packages;
- marketing measures for the research and imposing on the consumer certain products;
- unpacking of products and preparation for separate disposal of rubbish;
- Garbage collection and industrial sorting;
- commercial activity with sorted waste;
- industrial recycling into recycled material of sorted waste;
- industrial waste incineration;
- dumping of landfills and garbage dumps;
- maintaining landfill and landfill safety.

There is no compensation provided for significant profits from the commercial implementation of not only the most packaging products, and even garbage from it: after sorting; after processing into secondary raw materials; after heat treatment with the production of thermal energy and the use of solid residues, etc. Mass media such "subtleties" silence, but call and call for the protection of the ecology of landfills [10,11]. Thus, the general director of Ukrvtrom Petro Semko determines that on the thorns of Ukraine there are about 1000 harvesting and processing enterprises of different scales and forms of ownership, which, for

loading capacity, are forced to import garbage - from the total volume: 30% of waste paper; 20% glass shards; even taking into account the imported plastic provided to processing line, they are loaded only by 50%. At the same time, the same waste, but unsorted, is thrown away.

Perhaps it is all quite simple, it's enough to just interest the Ukrainian consumer to buy more and more products in packaging products and, after unpacking, to

a).



b).



c).



Fig. 3 General view of the package «Tetra Pak»

The product rinsed and the dried package is laid out on: a box (Fig. 3, b), which flatten and fold into the stack, and remove the fixture and cover (Fig. 3, c). But before processing the box you need to expand - to separate cardboard, polyethylene and aluminum. Today, in Ukraine, this is possible only in one processing facility, so nobody collects Tetra Pak. The same applies to opaque PET bottles [13] and several more products. There is an assumption - existing processing enterprises ..., and we only dispose of garbage in their landfills.

Solid household waste only the urban population of Ukraine is 40 million cubic meters per year or 10 million tons, which can potentially be classified, sorted and prepared for recycling [14]. But there is a question of expediency of this for the Ukrainian consumer. The existing processing capacity is almost harmful, and the choice of approach to the creation of the newest needs to be developed.

For the concept of "CONVENIENT FOOD" [1], the design of a "Transcendental Packing" packaging product is crucial not only for representations in relation to material [2] and form [3], but also the ability to conveniently dispose them. In this regard, it is expedient to consider a vast foreign experience, which is mainly based on the thermomechanical processing of carefully sorted packaging and waste garbage residues.

It is believed [14] that the direct use of the experience of the United States, Germany or France is impossible at least for purely technical distinctions. The

thoroughly clean and wash any container, to separate checks and labels, and to mix polymer and combined packaging together and to tightly separate and separate according to the chemical composition. But, far from being all sorted garbage can recycle existing enterprises [12], such as the box "Tetra Pak". This is the most commonly used packaging on the polymer backing (Fig. 3, a): a rectangular box of multilayer material (cardboard, polyethylene and foil), anchorages, and polymer housings.

heat buildup of waste in Ukraine is much lower (900...1300 kcal/kg against 2200...2600 kcal/kg) due to a substantially smaller share of paper and a larger 10 ... 20 times the content of the food component to a share of 30...40 % (because almost do not use sewage to flush at least a fraction of ground food waste). The burning of soot with adsorbed benzopyrene, dioxins, etc. requires an endurance of at least 2 seconds at  $T \leq 1200$  °C, which is practically impossible when burning low-solid waste. Technically, this issue can be solved, but it is expedient to implement it in the modern conditions of Ukraine to organize the system of collecting and sorting littered household waste.

According to the author, it is advisable to look at the landfills of Ukraine in a fundamentally different way.

CONSULT A CONSUMER, which may include:

- exemption from any preparatory action for the disposal of garbage in a designated place;
- exemption from any payment for any actions taken with garbage;
- exemption from any obtrusive offers of certain products.

ADVISE THE RETAINER, which may include:

- Granting ownership of collected garbage;
- granting of the right to privileges for the commercial use of garbage;
- Granting privileges for the commercial use of secondary raw materials.

TAKE INFO OF THE PACKER, which may include:

- stimulation of the reduction of assortment by nature and composition of raw materials;
- stimulation of multifunctionality of packaging products;
- stimulation of increase in the use of secondary raw materials.

And, in addition, to PREDICT MATERIAL CONSUMPTION OF THE CONSUMER – the creation of a SYSTEM OF MOBILE MILLING-PROCESSING POSTS that should commercially accept household waste in separate or sorted form. The owner of the item acquires all the rights to collected garbage and, according to the market conjuncture either after the commercialization of garbage is applied to enterprises with fine processing or rough processing and production of non-responsible general-purpose goods. Making gross recycling of garbage without additional sorting gives the owner the opportunity to earn extra profit, but involves the need to attract special equipment. It is fundamentally important to avoid the formation of a stench when it is roughly recycled, as for the convenience of residents, the location of such points is close to residential buildings. If you go for a modern overseas destination for the predominantly littered garbage, the need to attract additional technical measures for the reinstatement is unlikely to be competitive. Taking into account the incredible quantity of "Tetra Pak" products already buried in landfills and landfills in Ukraine, and the prospect of using this principle of the "Convenient Packaging" transformer packaging, prompts the solution of their utilization. First, to create new packaging of this type, it is expedient to reconsider the ratio of components (paper: polymer: metal), taking into account not only the functions of product storage, but also the possibilities of utilization under simplified conditions of rough processing of mobile items.

It is obviously a widespread notion [15] that domestic debris seems to be capable of turning into humus forests in conditions of any landfill. But in practice, rotting in landfills does not occur, because in multi-layer "towers" access to oxygen is simply impossible. Such debris can only attract rodents and homeless animals that uncontrollably multiply and spread infections. For air pollution, the most vulnerable is the state of burning garbage - the release of

carcinogens (compounds dioxin-like, which occur when burned in the presence of chlorine-containing organic substances).

It may be inappropriate to create such conditions for rough processing and to improve environmental protection measures, but it is enough to limit the mode of thermal influence on the melting temperature of the polymeric component of the garbage. The low processing temperature reduces the energy intensity of the warm process, but requires the creation of a fundamentally different processing equipment, the complexity of which will determine the design and composition of the multilayer packaging product.

### **Conclusions**

Thus, the proposal to change the perceptions regarding the organization of household waste processing will allow not only to resolve the issue of existing landfills by destroying previously buried products such as "Tetra Pak", as well as developing the packaging transformer-product "CONVENTIONAL PACKAGING" to take into account the convenience of utilization. But it requires the creation of a fundamentally new specialized equipment for heat treatment.

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## УТИЛІЗАЦІЙНА СКЛАДОВА ПАКУВАЛЬНОГО ВИРОБУ-ТРАНСФОРМЕРУ «ЗРУЧНА УПАКОВКА» ЗА КОНЦЕПЦІЮ «ЗРУЧНА ЇЖА»

Науменко О.П.

Концепція «ЗРУЧНА ЇЖА» передбачає спрощення повсякденного харчування пересічного споживача на підставі характерних особливостей. Одна із яких пакувальний вироб-трансформер «ЗРУЧНА УПАКОВКА», проект концепції якого передбачає не тільки ґрунтовний вибір матеріалу за специфічними функціональними вимогами, а й перегляд відношення за надуже зручним, чомусь, питанням – можливість і корисність для споживача утилізації. Оскільки існуючі вимоги до сортування, збирання, підготовки, переміщення, переробки таропакувальних залишків не уникає потреби у сміттєзвалищах. На підставі все зростаючих законодавчих вимог до утилізації сміття напрямом на пошук засобів підвищення ефективності використання й переробки таропакувальних виробів сприяє виникненню самостійної високотехнологічної галузі. Характерна особливість полягає у цілеспрямованій праці дослідників та інженерів за двома зустрічними напрямками - насичення технології виробництва при одночасному облеґшенні технології переробки. На думку автора доцільно принципово по іншому поглянути на звалища України - зацікавити споживача, переробника, пакувальника. А крім того, у якості посередника, на комерційній основі створити систему мобільних заготовчо-переробних пунктів досортування сміття для переробних підприємств та самостійної грубої теплої переробки. Таким чином, надана пропозиція до зміни уявлення відносно організації переробки побутового сміття зможе дозволити не тільки вирішити питання існуючих сміттєзвалищ за рахунок знищення раніш захованих виробів типу «Тетра Pak», а також при розробці пакувального виробу-трансформеру «ЗРУЧНА УПАКОВКА» врахувати зручність утилізації. Але потребує створення принципово нового спеціалізованого обладнання теплої переробки.

**Ключові слова:** зручна упаковка, тепла переробка, зручна утилізація.

## УТИЛИЗАЦИОННАЯ СОСТАВЛЯЮЩАЯ УПАКОВОЧНОГО ИЗДЕЛИЯ-ТРАНСФОРМЕРА «УДОБНАЯ УПАКОВКА» ДЛЯ КОНЦЕПЦИИ «УДОБНАЯ ЕДА»

Науменко А.П.

Концепция «УДОБНАЯ ЕДА» предусматривает упрощение ежедневного питания обычного потребителя на основе характерных особенностей. Одна из них упаковочное изделие-трансформер «УДОБНАЯ УПАКОВКА», проект концепции которого предусматривает не только обоснованный выбор материала за специфическими функциональными требованиями, а и пересмотр отношения к не очень удобного, почему-то, вопроса – возможность и полезность для потребителя утилизации. Поскольку существующие требования к сортированию, сбору, подготовке, перемещению, переработки таропакувочных остатков не исключает потребности в мусоросвалках. На основе все возрастающих законодательных требованиям у утилизации мусора направление на поиск средств повышения эффективност использования и переработки таропакувочных изделий способствует возникновению самостоятельной высокотехнологической отрасли. Характерная особенность состоит в целенаправленной работе исследователей и инженеров по двум встречным направлениям – насыщение

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технологии изготовления при одновременном облегчении технологии переработки. По замыслу автора, целесообразно принципиально по-другому посмотреть на свалки Украины – заинтересовать потребителя, переработчика, упаковщика. А, кроме того, в качестве посредника, на коммерческой основе создать систему мобильных заготовительно-перерабатывающих пунктов досортирования мусора для перерабатывающих предприятий и самостоятельной грубой тепловой переработки. Таким образом, представлено предложение к изменению представления относительно организации переработки бытового мусора может позволить не только решить вопрос существующих мусоросвалок за счет уничтожения ранее захороненных изделий типа «Tetra Pak», а также при разработке упаковочного изделия-трансформера «УДОБНАЯ УПАКОВКА» учитывая удобство утилизации. Однако требует создания принципиально нового специализированного оборудования тепловой переработки.

**Ключевые слова:** удобная упаковка, теплая переработка, удобная утилизация.

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