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THE USE OF BIODEGRADABLE UTENSILS IN RESTAURANTS

ВИКОРИСТАННЯ БІОРОЗКЛАДАЛЬНОГО ПОСУДУ У ЗАКЛАДАХ РЕСТОРАННОГО ГОСПОДАРСТВА

Анотація*. У статті розглянуто види біорозкладального посуду, який може бути використаний у закладах ресторанного господарства. Проаналізовано, що такий посуд добре тримає форму при фасуванні в нього гарячих страв. Може використовуватись для зберігання рідких страв та соусів протягом 24 годин без промокання та розм'якшення. Біорозкладальний посуд є ідеальним рішенням для кейтерингу, а також придатний для підігрів у мікрохвильових печах різної потужності.*

Встановлено, що біопосуд можна легко утилізувати разом з іншими харчовими рештками, що значно полегшить роботу ресторану зменшуючи кількість відходів та дозволить повністю відмовитись від сортування пластику.

Досліджено, що на сучасному ринку представлено біорозкладальний посуд виготовлений із різної природної сировини: макухи цукрової тростини, кукурудзяного крохмалю та кавових відходів.

Виявлено, що Компанія ІНФЕРРА ПАК була однією із перших хто почав займатися виготовленням екологічного одноразового посуду з біо-матеріалів. Завдяки інноваційній технології вторинної обробки целюлози, крафт посуд містить на 30% більше вторинно переробленої сировини, ніж звичайний паперовий посуд. Унікальність даної екологічної продукції полягає в тому, що термін її повної утилізації в грунті становить близько 180 днів. Біо стакани з крафту легко утилізуються за допомогою природних біокомпонентів - а це означає, що використання такого одноразового посуду не залишає сміття та не завдає шкоди навколишньому середовищу.

Зясовано, що перевагою використання екологічно чистого одноразового пакування з біопластику є можливість його компостування. За певних умов, PLA за 3 місяці може повністю розкластися до води та вуглецю. Для розкладання необхідні температури не менше +55 - +70 °С та вологість, які можуть забезпечити тільки комерційні установки для компостування. Крім цього, при виробництві біополімеру виділяється набагато менше вуглекислого та інших парникових газів. Перехід зі звичайного пластику на біопластик зменшив би викиди парникових газів до 25% Використання PLA пластику дозволить зменшити залежність від пластмаси на нафтовій основі, що, в свою чергу, зменшить попит на неї.

Abstract. *The article considers the types of biodegradable utensils that can be used in restaurants. It is analyzed that such utensils hold their shape well when packing hot dishes in it. Can be used to store liquid dishes and sauces for 24 hours without getting wet and softening. Biodegradable utensils are an ideal solution for catering, and are also suitable for heating in microwave ovens of various capacities.*

It has been established that organic utensils can be easily disposed of together with other food residues, which will greatly facilitate the work of the restaurant by reducing waste and allow you to completely abandon the sorting of plastic.

It is investigated that biodegradable utensils made of various natural raw materials are presented on the modern market: sugar cane cake, corn starch and coffee waste.

It was found that the company INFERRA PACK was one of the first who began to manufacture environmentally friendly disposable tableware from bio-materials. Thanks to innovative pulp recycling technology, kraft tableware contains 30% more recycled raw materials than ordinary paper tableware. The uniqueness of this ecological product is that the term of its full utilization in soil is about 180 days. Kraft organic glasses are easily disposed of with natural biocomponents - which means that the use of such disposable utensils does not leave garbage and does not harm the environment.

It was found that the advantage of using environmentally friendly disposable packaging made of bioplastics is the possibility of composting. Under certain conditions, PLA can completely decompose to water and carbon in 3 months. Decomposition requires temperatures of at least +55 - +70 ° C and humidity, which can only be provided by commercial composting plants. In addition, the production of biopolymer emits much less carbon dioxide and other greenhouse gases.

Switching from conventional plastics to bioplastics would reduce greenhouse gas emissions by up to 25%. The use of PLA plastics will reduce dependence on petroleum-based plastics, which in turn will reduce demand for them.

***Key words**: biodegradable utensils, ecological packaging, biopackaging.*
біорозкладальний посуд, екологічна упаковка, біопакування.

Introduction. Today, one of the most important causes of pollution is the oversaturation of the environment with plastic. And, unfortunately, the hotel and restaurant business is also involved. Due to careless use of plastic utensils in recent years, the planet is under threat. 73% of the world's waste is plastic: bottles and lids, disposable tableware, food wrappers and polystyrene containers. According to disappointing forecasts, in 35 years in the oceans for 2 tons of fish will be 1 ton of plastic and almost every species of seabirds on the planet will be forced to consume plastic. Due to the fact that it is not possible to recycle this type of waste, about 1/3 of all plastic is not recycled, but into the world's oceans. Instead, the duration of its disintegration is from 450 years to eternity. The biggest source of plastic today is packaging materials. Among them is disposable utensils, which are served at street food festivals or offer to take food home from a restaurant. Today, this is almost half of all plastic waste generated worldwide, and most of it is not recycled or incinerated.

Research methods. In the article we use the following research methods: deduction, induction, analysis, synthesis, explanation.

Formulation of research. The purpose of this work is to study the model of implementation of green technologies in the restaurant industry by using biodegradable packaging.

Analysis of resent research and publications. Edible utensils are products made from food raw materials that can be consumed with a drink or meal. Leading scientists from developed countries are developing such utensils, because today our planet suffers from billions of tons of plastic (more than 80% of all waste in the world's oceans), which decomposes over the years. Scientists have found that there are currently 6.3 billion tons of plastic waste on Earth, which will double by the middle of the century. The proposed replacement is a way to reduce the environmental impact [1-6].

The European Commission has approved a ban on disposable products made of polymeric materials, including disposable tableware, cutlery, beverage straw tubes, cotton swabs and plastic balloon mounts. They will be replaced by more environmentally friendly alternatives, such as paper straws, water containers, cups and spoons of cookies. The use of disposable plastic bags and packaging offered by supermarkets is also planned to be significantly limited, which will reduce carbon dioxide emissions by 3.4 million tons. In addition, the proposals will help preserve the environment, as the amount of damage by 2030 could reach 22 billion euros (due to the reduction of clogged areas, the cost of filters) [7-9]. The use of edible utensils, unlike synthetic ones, will improve the ecological situation in the world, as the replacement of 1% of disposable

utensils will save more than 2 million m2 of forest plantations, avoid pollution of more than 10 billion m3 of water and, most importantly, eliminate more than 10 million kg of waste. need to be reworked. Along with the development and implementation of edible utensils, the "natural brand" is gaining popularity, because instead of gluing the brand, it is now applied by laser to the skin of fruits and vegetables, which has no harmful effects on products. Rewe and Penny tested laser technology designed to apply text and images directly to products (the first such products were avocados and sweet potatoes). It is predicted [10-12] that in 2020 "bioplastics" will become a competitive alternative to petroleum plastics, which are made from organic materials (corn, wheat, sugar beets and even tomatoes) and after disposal become fertilizer.

Dmytro Bidyuk presented the Rekava project in 2021, which was developed for the production of biodegradable tableware. For about three years, the researcher worked on creating containers from coffee waste. In November of this year, a biodegradable beaker from coffee residues was presented.

Rekava is a philosophy of food waste management, which is the foundation of their activities. These are the views of the founders of the project on the rational use of resources, environmental protection and the creation of the desired product.

The process of making an eco-cup looks like this: after making coffee, waste is collected, sent to production, where it is cleaned, dried and pressed. After that, the pressed coffee residue is treated with a special protective layer and made into cups.

Such eco-cups have a number of advantages:

1. Decomposes within 1-5 months
2. After use, can be used as animal feed or fertilizer
3. They do not contain chemicals and consist only of plant components.

The project is nearing completion and is moving into production, which is planned to be launched in Kyiv. Already in 2022, consumers can buy and test these products.

Presentations of the main results. Today, the trend towards anti-consumption is intensifying, in particular, society seeks not only to save the Earth's resources, but also actively fights for a safe environment. This trend is also affecting the food packaging industry, dictating to producers the demand for packaging and disposable tableware that do not pollute the environment and are made from renewable materials.

INFERRA PACK is one of the pioneers in the field of ecological disposable tableware made of bio-materials. Kraft paper cups and gastronomic containers made of 100% from processed raw materials are presented on the Ukrainian market. Thanks to innovative pulp recycling technology, kraft tableware contains 30% more recycled raw materials than ordinary paper tableware. The uniqueness of this ecological product is also that the term of its full utilization in soil is about 180 days. Kraft organic glasses are easily disposed of with natural biocomponents - which means that the use of such disposable utensils does not leave garbage and does not harm the environment.

In addition, the use of kraft paper cups and containers is a direct indication of concern for the environment, as well as a great opportunity to enhance the image of restaurants with environmentally friendly packaging. The sizes of paper disposable kraft glasses make: 110, 250, 360, 450 ml. Sizes of disposable kraft containers: 250, 375, 500 ml. Disposable food container can be supplemented with a paper or polypropylene lid.

For ice cream and desserts, special ice cream cones are made from recycled PET. These plastic cups are perfect for ice cream, frozen yogurt, parfait, mousse, fruit salads and sherbets. Exquisite vortex design perfectly emphasizes the products of the institution. For convenience, the container is presented in three sizes - 185, 250 and 375 ml. The set also includes flat and dome-shaped covers, with and without a hole. One size of cover is intended for all types of containers.

Dome-shaped lids allow you to add a variety of fillings and toppings, chopped nuts, fruits, sweet sauces and candies.

rPET is an environmentally friendly material for disposable packaging. Disposable ice cream and dessert cups are made from recycled PET, which contains at least 50% of recycled PET bottles. When using rPET, the amount of primary plastic is reduced. This, in turn, reduces the amount of plastic waste in landfills, oceans and forests.

PET bottles are collected, sorted and recycled for rPET production. Next, plastic flakes are melted and used to produce new products. A unique feature of recycled PET is that the production of a new product from a recycled bottle requires 75% less energy than the production of a product from new plastic. Thus, much less harmful carbon dioxide, which is one of the greenhouse gases, is released during this process. rPET is a favorite material for the production of disposable goods due to its transparency and durability. This material is very resistant to oxygen, water and carbon dioxide, and it is completely harmless for use with food and beverages. Recycled PET can withstand temperatures from -23˚C to + 66˚C. Products with rPET can be recycled.

Biodegradable and composted PLA food packaging and utensils

Pollution of our planet with plastic is one of the biggest problems for the environment. Petroleum-based polymers are used in everyday life and our unlimited use will result in huge amounts of plastic ending up in landfills, oceans, air and the human body. According to disappointing forecasts of scientists, by 2050 the natural areas of the earth will be contaminated with 12 billion tons of plastic! Such predictions are of concern to the general public, where most countries are beginning to take steps towards a more sustainable future. The solution to this global problem is possible in four main areas: reduction, reuse, recycling and replacement, or the rule of four R: (reduce, reuse, recycle, replace) in English.

Rule of four Rs in disposable utensils

Reducing the amount of plastic means purchasing only what is needed, thereby reducing the amount of unnecessary packaging. Reuse means

choosing products that can be reused, such as water bottles, reusable food containers and cloth bags for shopping. Waste reprocessing means the reprocessing of products in order to obtain raw materials for the production of other products. Replacement means finding alternatives to plastic.

One such alternative is plant-based plastic.

PLA (or polylactic acid) is a type of plastic made from sugar cane or cornstarch. In 1920, Wallace Carothers first invented PLA plastic when trying to make environmentally friendly plastic for the production of DuPont chemicals. However, this was a very expensive process, so it was temporarily paused. Many years later, Patrick and Sally Gruber were able to invent PLA plastic from corn at home, using a conventional household oven. This discovery significantly reduced the cost of bioplastic production. The production process is as follows: corn grains are soaked in hot water with the addition of sulfur dioxide solution, which allows them to break down into fiber, protein and starch. After that, the corn oil is separated from the starch, and the kernels are crushed. Next, by adding citric acid, a long-chain polymer is formed, which is the basis for plastic. To date, PLA is the cheapest bioplastic for production. It is also used for 3D printing, disposable packaging, as well as in the medical field.

CPLA (crystallized polylactic acid) is a heat-resistant type of PLA. It is often used for the production of disposable cutlery. CPLA can withstand up to + 90˚C, unlike PLA, which is not recommended to heat above + 40˚C.

Advantages of disposable tableware and packaging made of PLA plastic.

The biggest advantage when using environmentally friendly disposable packaging made of bioplastics is the possibility of composting. Under certain conditions, PLA can completely decompose to water and carbon in 3 months. Decomposition requires temperatures of at least +55 - +70 ° C and humidity, which can only be provided by commercial composting plants. Due to the fact that such installations are not available in all cities, we call for the separation of PLA from other plastics during disposal.

Nevertheless, biopolymer production leaves less carbon footprint, as much less carbon dioxide and other greenhouse gases are released during its production. In 2017, a study (2) estimated that switching from conventional plastics to bioplastics would reduce greenhouse gas emissions by up to 25%. The use of PLA plastics will reduce our society's dependence on petroleum-based plastics, which in turn will reduce demand for her. Among other things, the combustion of PLA emits significantly less carbon dioxide than the combustion of polymers such as PS, PET, PP and PE.

Disposable eco lunch boxes for food and packaging for burgers with minerals were created in 2020, when the main trend was environmentally friendly and safe attitude to the environment. That is why socially responsible business in Ukraine has begun to move to modern disposable tableware, which is easily decomposed or recyclable. This approach speaks of concern for the future of their country,

the environment, interest in meeting customer needs.

Eco food containers have become an ideal replacement for environmentally hazardous thermal containers made of expanded polystyrene. After all, this material is rejected around the world. For example, in the United States, many states have already banned the production of polystyrene foam utensils, and in Europe, such utensils are prohibited by law from 2021. This is due to the fact that most products made of this material are not recyclable, and waste quickly pollutes the planet's environment.

Modern Eco food utensils are made of 50% polypropylene. This material is subject to recycling. The rest - 50% consist of natural, decomposing mineral components.

Using such disposable lunch boxes for cooking, business, thus, worries about the future of Ukraine and the ecological state of the planet.

Eco food containers are suitable for:

- restaurants and cafes with takeaway service;
- delivery services;
- chain stores with a culinary department.

Containers with lids for food are also convenient for transportation, storage in the refrigerator and for heating food in microwave ovens. These are airtight constructions that do not leak, retain the taste properties of products.

Today, taking away food or delivering delicious food to your home or office has become an integral part of our lives. Most often, more and more institutions offer such a service to their customers. After all, it helps to save your time and enjoy your favorite food in any place and situation. The main task of the restaurant is not only to prepare a special dish, but also to take care of the preservation of products packed in disposable utensils.

The advantage of such Eco lunch boxes is that:

- such materials are recyclable and decompose in nature into safe components;
- Containers protect food from foreign tastes, preserve the taste, the initial temperature of the hot dish. These thermal containers for food can be used for meat products, fish, burgers, desserts;
- ergonomics of products, convenience for transport delivery services, delivery to the destination of the dish in its entirety;
- tightness of the structure, the lid of the lunch box fits snugly due to the Smartlock system, so that sauces and liquid do not leak during transportation;
- they can heat food, eco containers with lids can withstand temperatures up to 120 degrees;

When choosing ecological utensils for products, the company chooses the path of a socially responsible company that cares about its customers, is friendly to the environment and the future of the country. Eco containers for food delivery are a modern and right step forward for Ukrainian business.

Disposable tableware should be not only convenient, but also safe for health and nature. Therefore, being environmentally friendly is the task of modern business in Ukraine. You can now follow the path of the European Union and the United States by

choosing the right packaging for food delivery.

Disposable tableware and bamboo packaging

One of the new types of biopackaging is paper eco-packaging for food made of bamboo, the range of which includes: containers for salads, containers for second courses, glasses for hot drinks, containers for soup with a lid, packaging for fast food.

- Bamboo is the most promising material from the list of environmentally friendly and environmentally friendly. This perennial, evergreen plant grows incredibly fast. Depending on its variety, bamboo can grow up to 120 centimeters per day;
- Being a rapidly renewable ecological natural resource, the use of this herb in the production of pulp allows you to save other trees that grow for decades;
- Disposable utensils and packaging based on bamboo raw materials do not have a harmful effect on humans;
- When disposing of such products decompose without the release of harmful substances and compounds;
- Bamboo packaging has a natural beauty, lightness and aesthetics. Ivory color is trendy and is considered a color of luxury and a sign of excellent taste;
- Food packed in a bamboo container, like any other dish, will look presentable and appetizing and will encourage the customer to make a purchase;
- Packaging for salads, main dishes, soups - grease and moisture resistant. Container lids are sealed tightly, which allows the customer to deliver the product in the best shape;

Recently, the Polish company Biotrem, which produces organic dishes from bran, opened a representative office in Ukraine.

The company has patented a technology that allows you to make disposable utensils from wheat and corn bran, cassava products, algae, and plant-based polymers. The raw material is compressed under pressure with hot air. One ton of wheat bran can be turned into 10,000 plates or bowls.

The set of utensils includes plates, cups, forks and spoons. Such utensils are hard and durable enough to heat food in them. After use, you can feed animals and birds. Completely decomposes in 30 days.

The developers claim that one kilogram of wheat bran products - wheat processing, transportation, processing and disposal - generates about 1.3 kg of CO^2, while one kilogram of polystyrene disposable plates or cups generates a total of about 8.5 kg of CO^2.

Biotrem is a Polish technology company that processes the technological process of production of disposable tableware and packaging from organic raw materials. The patented innovative technology allows the company to produce biodegradable disposable tableware from environmentally friendly raw materials, such as wheat and corn bran, cassava, algae and plant-based polymers. Thanks to this, Biotrem can produce plates, bowls, cups without the need for plasticizers and other chemical compounds. Biotrem products are not only safe and completely biodegradable, but also reduce waste flow and help save the environment. Biotrem has its own plant and supplies its products to mass customers, including restaurant chains and

retailers, directly or through independent distributors.

Conclusions. As customers' concern for the environment grows, the demand for products and services designed to be less harmful to the environment has increased. Using "green" methods, many business owners believe that the image of their companies can be improved. In addition, an improved image can ultimately motivate customers to use products or services. The restaurant industry is also witnessing the "green" movement. Restaurant owners use environmentally friendly methods in their facilities to create a distinctive image that can set them apart from their competitors. Therefore, restaurateurs seek to gain this competitive advantage by implementing green practices in their restaurants.

To meet the growing demand for "green" products and services, marketers in all industries are investing heavily in the development and promotion of environmentally friendly products. The focus on environmental friendliness has prompted the restaurant industry to also adjust its services to meet changing customer expectations. Restaurant owners take Green Practice (GP) to their facilities by becoming members of a green association such as the Green Restaurant Association (GRA).

Biodegradable utensils on the market today can be used to store liquid dishes and sauces for 24 hours without getting wet or softening. Biodegradable utensils are an ideal solution for catering, and are also suitable for heating in microwave ovens of various capacities. Such utensils are well suited for serving food in the restaurant, on the street and for takeaway

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