

Research Article

Research on the Food Green Packaging Under the Sustainable Development

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Abstract: With the rapid growth in economy and the constant development in people living standard, packaging has become an indispensable part to human activities. However, the ways and materials popular used for packaging currently have been making a great deal of recourse waste and serious pollution to the environments. From the existing problems in food packaging, the study has put forward the necessity of green packaging under the idea of sustainable development and discussed the approach of green food packaging to environment protection.

Keywords: Food packaging, green packaging, packing material, sustainable development

INTRODUCTION

Packaging and environments have been a hot topic among the global. Along with the rapid economic development and people living standards enhancement, People's life conception and consumption models have been changed greatly and the new demands for food packaging have been made. Besides the diversification and multi-function to meet the consumer needs in different levels, the negative effects of food packaging to ecological environment and resource consumption should be cut down to the minimum, including the raw materials selection of packaging products, production and processing, usages and circulation and the post-treatment of waste, etc., (Zhu, 2012), which arouse the demands on how to make the packaging adaptable to the environment protection (Peng, 2011). In the international study development of green packaging, green packaging should balance the relationships between the packaging and environment, resources, energy consumption, the disposal of waste and people's health. What the complex system influenced by the multi-factors is composed is those mutual connections (Feng and Liu, 2011). To scientifically study and develop the system is one of the environments protection topic urgent to be solved (Zhang *et al.*, 2014).

MATERIALS AND METHODS

The backwardness of after-treatment technology of disused food packaging: As it is disposable consumption with short life circle and large waste pollutants, packaging has taken up a great proportion of city waste; the food package, more are solid waste, has become a major part of city life trash. According to the statistics in US, Japan and EU, the annual emissions of PSW are about 1/3 of Musical solid waste in weight, 1/2

in size and are increasing by 10% every year. The packaging waste untreated or mishandled not only could cause severe pollution in air, groundwater and solid, but also could make the land resources occupied by garbage and natural landscape suffered a great destruction. Nowadays, the disposal of municipal solid waste is mainly buried, composted and burned, among which buried ones occupy more than 70%, composted is about 20% and burned is in small percentage (Gao and Xiong, 2012). Even though the rate of waste disposal has been becoming higher year on year, there is still a large gap to the environment harmlessization.

The discharge of large toxic substances in industrial production of food packaging: With the deep research of food packaging materials, a variety of package in materials to meet the food sanitation standard have been made a significant progress and all the edible materials have been developed, but a great many materials could cause pollutants in the industrial production of food packaging, which are mainly the gases of Sulfur dioxide, chlorine, phosgene, formaldehyde, hydrogen fluoride and the substances of Phenols, benzene and styrene's; in addition, the work site of metallic material could produce dust, all of which can result in the pollution in different degree to the air, solid and water resources. Sulfur dioxide, as one of the main air pollutants, can be oxidized by the metal catalyst as iron, copper, magnesium contained in the airborne particulate matter and dissolved in rain, snow to become H_2SO_3 , H_2SO_4 , which will make the rain acidic as Acid rain. Chlorine will both endanger people's health and get into the issue of plants leaves to destroy the chlorophyll quickly with the leaves shriveled, withered and dropped down. What's more serious, the $COCl_2$ will be formed if the Chlorine and carbonic oxide are met.

Considerable destruction to the environment resources by the food over-packaged: Relative to the packaged food, the food over-packaged are overabundant in packaging layers, materials and structural design and are excessive in function and exorbitant in costs. There are three main types: luxurious packaging, false packaging and matched packaging. For example, the moonquake over-packaged, the matched package of tea, excessive packaging of health products and the luxurious packaging of wine. Considering the food's edible features, raw materials that wood, oil and steel are the scarce resources in our country are normally used in food packaging. Excessive packaging has wasted the great number of our valuable resources severely and influenced the environmental sustainable development badly. Yet the wastes made by the food over-packaging can be seen everywhere and the resources waste caused by the pursuit of external packaging are on the increase and shocking.

The theory of green packaging and its connotation: The declaration of "Our collective future" issued by UNCET in 1987, the green theory to advocate nature and protect environment was formed in the green wave of environmental protection and resources conservation due to "The Rio Declaration on Environment and Development" and "UN Agenda21" in June, 1992.

Under the advance of green theory, "green packaging" as a new concept to solve the problem between packaging and environment has sprang up since the end of 1980s and the beginning of 1990s. The new concept was called as "pollution-free packaging", "environment friendly packaging" or "ecological packaging" in the developed countries and it has been called as "green packaging" since 1993 in China.

Until Now, there was no clear definition about green packaging, but the green packaging generally agreed refers to ones that can be recycling used and degraded to save resources and energy, its process of packaging products from materials, manufacturing to the waste disposal being harmless to people's health and environment with proper packaging. Therefore, green packaging means to save resources and energy in order to avoid waste, recycle and reuse easily and degrade for the purpose of satisfying the protection of ecological environments. Packaging has already been complied with the principles of "3R" and "1D" in developed countries, which are Reduce, Reuse, Recycle and Degradable. With the continuous extension, consumers have asked for the demand of "4R1D" in newly packaging, which Refill is added on the principle of '3R1D".

The difference between the traditional packaging design and green packaging design: Traditional packaging design could only take the function, quality and life cycle into consideration without thinking of the environmental influence brought by the products being

used and disused, which leads to the large energy consumption, resources waste and small recovery. Green package design must prevent the environmental pollution and resources waste fundamentally at every stages of concept formation of products to the production, even to the recycling use and disposal after its being deserted. The packaging is characterized by the sizes which should be minimized without unnecessary space, the recycling which should be made possibly and the waste which should be as little as possible and easily handled. For example, a French dairy company whose Yogurt boxes and cups are made by extracting the milk from the sugar beet. The basic raw materials of this ecological box are sugar beet mixed with mineral substance to form a light and solid material, the box and cups made from this material to be decomposed into fertilizers under 55°C in 60 days.

Right understanding of the connotation of green packaging: Green packaging can't be defined as the green of packaging in simple and one-sided way, mistakenly treating the package products with the materials to be easily decomposed as the green packaging without considering whether the manufacturing of packages could lead to the environment pollution and resources waste and whether the packages could be recycled after use. Such as paper packages are regarded as the green ones, but plastics are not, even with the idea of plastics package should be replaced by the papers fully since polythene is toxic. In fact, the influence of products packages to environment should be observed and considered in dialectical and scientific way. Recovery processing being improper, paper packages can not conform to the demand of green packaging, whereas the plastic ones should be advocated if the minimization, reutilization and harmlessness are being achieved. Plastic harmless to food owing irreplaceable advantages to other package materials, complete prohibition of plastics will give rise to more pollution and waste.

RESULTS AND DISCUSSION

The positive exploitation and promotion of green packaging materials: The so-called green packaging materials are the ones which can be recycling, reusing or degradable without resource wastes and harmless to the people and environment during its life cycle. The green packaging materials in essence contains environment protection and resources regeneration, thus forming a closed ecological circle, which is shown in the Fig. 1.

Paper packaging materials: Since paper package can be recycled after using and a small amount of waste can be decomposed spontaneously in the nature without negative effects to the environments, the paper, pasteboard and paper products are recognized as the

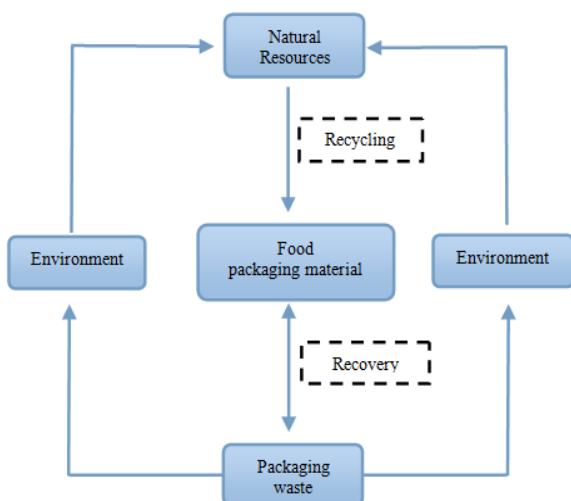


Fig. 1: Eco-cycle system of package materials

green products worldwide, which conform to the demands of environment protection and play a positive and replaceable role to control the white pollution caused by the plastics.

With the scientific and technological development, a large number of hi-tech wrapped papers have been advanced recently. Such as, the insulation paper issued by the US can convert the solar energy into the heat, which function is like the solar collector. Food wrapped by it and put in a sunny place, the food in it can be heated and its heating will be dissipated when the package is opened. Antiseptic paper produced by a Japanese company can be used for wrapping food. With this kind of paper package, the gravy food can be kept under the high temperature of 38°C within 3 weeks with no deterioration. The fruit residues paper is made from the apple residues deserted in food industry, which is easily decomposed after using and can be burned or composted and can be recycled to make the papers with less pollution to the environments, so it is suitable for the food packaging (Geng, 2011).

Degradable materials: The degradable materials are the materials deserted can be split, degraded and reduced in natural environment with the effect of natural light, or the micro-organisms in soil and water, it reentering into the ecological environment and returning to the nature in nontoxic ways. In Northern American, degradable plastics have grown at 17%/annum, whereas at 59%/annum in Europe (Zhang *et al.*, 2014). According to the statistics investigated by Degradable Plastic Professional Committee of China's Plastics Association, the enterprises and institutions engaged in the research and production of degradable plastic were more than 100 in 2002. Such as, Under the support of China National Packaging Corporation and Ministry of Science and Technology, Hunan Industrial University and Guangdong Zhaoqing Fangxin Packaging Material

Company have co-studied and developed the water-soluble film and production facilities having been put into operation. Shanghai Chemical and Industrial Corporation has already advanced the BOPLA extracting maize as raw material. In addition to the degradation, this film is applicable to the candy packages with high gloss, fine transparency and superior heat seal-ability as well as the steady folding and great strength.

Recyclable packaging materials: The recyclable package has adopted the glass, such as beer, beverage, soy sauce, vinegar, etc. PET drink bottles and PC milk bottles used in Sweden and other countries can be reused up to 20 times. The recovery of PET containers in Dutch Wellman Company and American Johnson Company is 100% (Kang, 2011). The reused package like PET bottle retrieved can be regenerated in physical way, which is to be purified and smashed directly and completely and to make the packaging container regenerated with the treated plastics.

Edible packaging materials: The edible packaging is the one which can be converted into an edible raw material when the packaging functions are achieved to be deserted. The edible packaging is a kind of packaging material like paper made from edible raw materials, which is a special packaging to realize the transition of packaging functions. There are two categories of the edible packaging: one is the edible paper food packaging as thin as paper that is gone through paper processing using common ingredients (starch, sugar, etc.) and some condiments; the other is a kind of edible scrap of paper made for the food packaging by the modification of edible nontoxic fiber and the utilization of some food additives. Nowadays, the food wrapped by the food paper labelled with the different tastes of beef, chicken, apple and so on is very popular among the consumers, especially the edible paper food package employed in the soft drinks with the advantages of cold storage and cleanliness. There have edible packing films mixed soybean protein and starch in the market, which can retain moisture and impede oxygen to keep food's original taste and nutrient value. It's ideal to make food packaging container with the bean curd residue as the raw material which is the rejected waste during the manufacturing process of bean products with national annual output of about 800,000 tons, since the full exploitation of this waste resource can maximize the utility value of raw materials and avoid the environmental pollution.

CONCLUSION

Proper disposition of wastes: In the view of environment protection and resources conservation, the best practice for the disposition of food packing wastes

is still the recovery processing as the disposition of food packaging wastes and the exploitation of green packaging materials must be developed coordinative. Compared with the European countries on the recovery of packaging waste in the end of 20th century, the recovery rate of paper was only 20%, glass recovery was 10% and plastic recovery was 10% and the metal recovery was even less in China (Kang, 2011). Meanwhile, with the rapid economic progress and the increasing output of packaging products, the problem of recovery processing on packaging wastes must be dealt with seriously and the ecological recycling of the packaging wastes must be realized by the legislation. For example, German law has clearly stipulated that the recovery rate of 80% must be regarded as the minimum for the packaging materials like glass, tinplate, aluminum, paperboard and plastic since 1st, July, 1995 (Kang, 2011). Britain specified that 60% industrial packaging and 35% house ware packaging must be recovered and recycled at the beginning of this century (China Green Package, 2010). Relative regulations being further improved, the recycling of packaging wastes can be enforced. Furthermore, the policy of collecting garbage tax can be implemented in the large and medium-sized cities. The fees can be charged based on the number of garbage and the lower taxes and no taxes can be enjoyed if the packaging wastes are put into the recycle bin, but the more packaging taxes must be added if the packaging wastes cause the influences to the environments.

Possible simplification of package: Excessive package will cause huge waste of resources and the unnecessary environmental pollution, so many countries have already made the strict management and related laws on food packaging. Such as the packaging cost not exceeding 15-30% of product value; packaging no larger than 10 times of the packaged products (Zhang *et al.*, 2014). Now, more than 10 major food and drinks companies have signed the “Voluntary Packaging Agreement”, guaranteeing to cut down the materials for the product packaging and to protect the resource environment

(China Food Commerce, 2010). How to reduce the five types of food and drinks packaging materials, like plastics, steel, metal materials and glass, etc., will be studied in the “Voluntary Packaging Agreement”. For example, the cartons used for carrying the food or drinks can be redesigned to save the papers with the holes in every sides; Or the plastic bags made from lighter materials can be employed to hold the food or drinks in same weight; Or the foam plastic trays used for packing meat can be cut down.

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