

Main Experiences on Recycling of Waste in South Korea

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Abstract

South Korea has made remarkable achievements and gained many experiences on waste disposal and recycling, which help our country to develop cyclic economy and construct a harmonious society. This paper summarizes the policies, regulations and specific practices on waste disposal and recycling including industrial waste and household waste in South Korea so as to provide some references for the establishment of policies related to the waste recycling in our country.

Keywords : South Korea, Waste, Recycling, Experiences.

1. Introduction

As our country pays more attention to cyclic economy, it will have to focus more on waste disposal and recycling. South Korea, where recycling management began with the enactment of LRSR(Law for Promotion of Resources Saving and Reutilization) in 1992, has made remarkable achievements in this aspect through the joint efforts of all levels of governments, consumers and manufacturers. Reasonable institutional arrangement and innovation based on the characteristics of different wastes which obtained both social and economic benefits is the main approach to handling the problems of waste disposal and recycling in South Korea. In contrast, the correspondent policies in our country can merely achieve a so-so and passable performance. Main experiences on waste disposal and recycling in South Korea will be helpful to the reformation and development of cyclic economy in our country, which is of realistic significance for constructing a harmonious society.

Management responsibility system on waste disposal and recycling was established to clarify the main responsibilities, including ministry of environment, all levels of governments, producers and customers (See Table 1). Governments play a leading role in this system, formulating policies and regulations related to incentives of waste recycling and coordinating the relations of various fields. Customers and manufacturers are led to follow the relative regulations and cooperate with governments. In this way, each party performs its own functions and is charge of one's area, which will give much help not only to management but also to distribution and identification of rela-

tive responsibilities. This greatly improved the execution efficiency and feasibility of the relevant policies without unintended phenomena.

<Table 1> Management Responsibility System on Waste Disposal and Recycling in South Korea

Consumers (residents)	*Separate discharge of the recyclable goods*Separately discharge packaging materials bearing Separate Discharge Mark*Paper packages including milk-containing packs and plastic dish containers also should be separately discharged.
Local Governments	*Separate discharge of the recyclable goods*Public Relations activity on local residents*Plastic containers, milk-containing packs-those included in the mandatory separate discharge goods-should also be separately discharged.
Responsible Producers	*Performance of the recycling obligation
National Government (Environment Dept.)	*Law revision and general management of the system*Annual calculation and imposition of the mandatory recycling amounts*Authorization of the establishment of PROs
ENVICO	*Performing overall direction regarding EPR operation such as acceptance and approval of the implementation plans

Source : <http://www.envico.or.kr>

This paper will detail the policies, regulations and specific practices on waste disposal and recycling from two aspects respectively, including industrial waste and household waste, in South Korea.

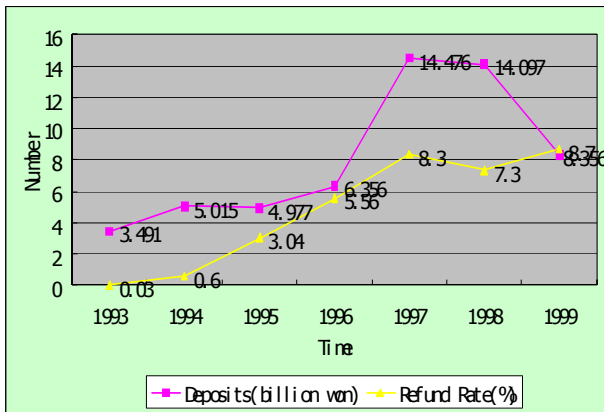
2. Waste Management Policies on Industrial Waste

2.1. Producer deposit-refund system (1992-2002)

Three main actors, namely the Ministry of Environment (MOE), the Korea Recycling Corporation (KORECO) and the producers, are involved in the Producer deposit-refund (PDR) system. In this system, the MOE requires producers to pay advance deposits to cover recycling costs, which are calculated according to the number of products manufactured in the previous years. Then, the advance deposits will be returned to the producers, the percentage of which is based

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on recycling number. In the first period (1992-1996), Producers' enthusiasm to participate in relative activities is not high owing to the low refund rate (See Figure 1). However, in the second period (1997-2003), the interests of producers are stimulated greatly because the deposit rate rose sharply. The administration concerning recycling accomplishment and unreturned deposits is managed by KORECO. The unreturned deposits are used for waste treatment, R&D of technology and energy conservation and environmental protection facilities construction project. The main characteristic of the system is that it puts more emphasis on the producer's economic responsibility for promoting waste recycling, institutionalizing it in the form of deposits.



Source: Environment White Paper (1993-2000)
 <Figure 1> Changes in Deposits and Refund Rates under the PDR System

2.2. Producer recycling system (2003-present)

Although PDR system had once played an important part in the waste recycling of South Korea, the production mode of enterprises were not basically changed. As the actual costs of recycling became higher and higher, more and more manufacturers pay the deposit rather to recycle waste. Under this circumstance, producer recycling (PR) system was established to replace PDR system. In PR system, the producers must recycle and reuse four kinds of packing materials, namely paper boxes, metal cans, glassware and synthetic resin, and five categories of products, namely home appliance, tire, lubricating oil, fluorescent lamp and battery. At the same time, number of recycling and reusing must be up to a certain percentage which is annually announced by MOE according to the recent recycling performances and recycling quantities undergone by manufacturers. Otherwise, the relative producers will be charged a fine up to a 1.15 to 1.3 times of recycling cost.

Each manufacturer can fulfill their legal obligation in the following three ways. One way is to construct their own recycling plant and do their own recycling. Another is to outsource the job to commercial recycling companies. The third is to join the Producer Responsibility Organization (PRO), pay the required fees, and have them do the recycling. Manufacturers can choose whichever option suits them best. At present, more than 80% of manufacturers adopt the last way to fulfill their legal obligation. Tens to hundreds of PROs have been all over South Korea. In order to put PR system into effect, the Korea

Environment and Resource Corporation (ENVICO) was established to be responsible for the overall duties related to the running system, such as keeping records on product shipments for each manufacturer, investigating the state of recycling performance and levying a recycling charges. Since ENVICO was built up, the waste recycling rate has risen by 7% to 12% every year, saving significant resources. In addition, ENVICO tries a lot to raise many funds to encourage and support relevant R&D of recycling technologies.

2.3. Other system on waste recycling

Besides, the MOD sets up a lot of other management systems to promote the recycling of waste, such as Extended Producer Responsibility, Business Waste Minimization System, and Hazardous Waste Management and so on.

2.3.1. Extended Producer Responsibility (EPR)

Since 2003, the effect of EPR has gained a great reputation promoting waste recycling. The EPR involves more than 20 items under the regulations. In this system, Control of Packaging Waste is very obvious. The South Korean government announced that the additional packaging of manufactured products which has the purpose of promoting sales of the product must be reduced by 80% by 2012. Because of packaging's bad effect on the environment, the government has started to regulate the packaging companies and carried out campaigns which pursue less product packaging. In 2008, packaging companies got together and agreed on plans to restrict packaging on their products. The manufacturers of products also agreed to the idea and joined the conference – they are planning to achieve certain levels in cutting packaging use.

2.3.2. Business Waste Minimization System.

Business waste disposal is the responsibility of the companies as generator of the waste. Business waste minimization system was established to guide them to make voluntary efforts to reduce and recycle waste for minimization of waste. On the premise of implementing waste reduction policies, the goals of waste reduction rate are set to 3~8% respectively (See Table 2).

<Table 2> Goal of Business Site Waste Reduction (Unit: Tons/Day)

Classification	2000	2005	2006	2011
Estimated Generation Volume	187844	280340	316691	356413
Reduction Volume(Target Reduction Rate)	-	8410(3.0%)	19001(6.0%)	28513(8.0%)
Actual Generation Volume After Reduction	-	271930	297690	327900

Source : <http://www.envico.or.kr>

2.3.3. Designated (Hazardous) Waste Management

In South Korea, the Hazardous Waste is always defined as Designated Waste, which is controlled under the Solid Waste Management Act. With the development of industrialization in South Korea, the generation of hazardous waste significantly increases. Therefore, the governments attach more attention to the hazardous waste management. In South Korea, each hazardous must be treated in the legal methods. Meantime, in view of the difficulty and high cost of hazardous waste treatment, a special regulation, called Hazardous Waste Charge System is drawn up, which is a system that charges the manufacturer of the product part of the cost involved in disposing of a product that contains hazardous materials or that is not easy to recycle and may cause problems in waste management, in order to restrict waste generation and prevent the wasteful use of resources, the standards of which are shown in the Table 3.

<Table 3> Standards for Charges Calculation

Item	Classification	2008-2009Rate	2010-2011Rate	2012Rate
Pesticides and Toxic Products(unit)	Plastic containers-equal or less than 500mℓ-over 500mℓ	-7won/ pesticides-6won/toxic-16won/pesticides-11won/toxic	-14.94won-18.42won	-24.9won-30.7won
	Glass containers-equal or less than 500mℓ-over 500mℓ	-11.24won-16.86won	-33.72won-50.58won	-56.2won-84.3won
	Steel containers-equal or less than 500mℓ-over 500mℓ	-10.78won-15.64	-32.34won-46.92won	-53.9won-78.2won
	Antifreeze(ℓ)	-37.96won	-113.88won	-189.8won
	Gum(sale price/imported price)	-0.36%	-1.08%	1.8%
	Disposable Diapers(unit)	-1.2won	-3.3won	-5.5won
	Tobacco(20cigarettes)	-7won	-7won	-7won
Plastic products(kg of synthetic resin input)	General plastic products	-30won	-90won	-150won
	Plastic for Construction(including plastic pipes &heat insulating material)	-15won	-45won	75won

Source : <http://www.envico.or.kr>

3. Waste Management Policies on Household Waste

In Korea, the waste that comes from homes is generally defined as Municipal Solid Waste (MSW). Owing to the limited carrying capacity of South Korea, the disposal of MSW has particular importance in South Korea. In 1995, the Korean government implemented the Volume-based Waste Fee System (Unit Pricing System) to alleviate the environmental impact and conditions MSW brought about. The UP system requires every household to purchase certified plastic bags for waste disposal, each of which is required to be marked clearly and respectively. As such, the MSW are supposed to be classified into unrecyclable and recyclable waste. The latter will be separated into paper, metal, plastic, glassware and then thrown into a separate plastic bin.

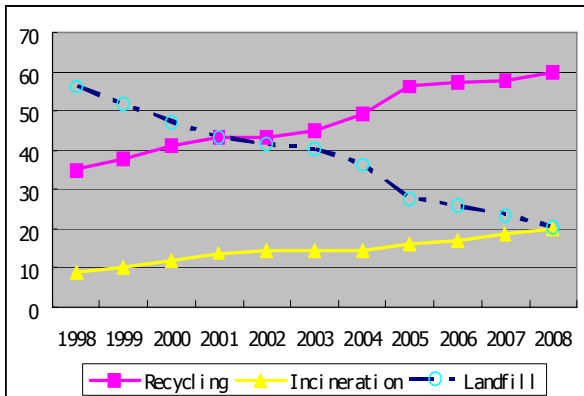
Food waste management is another important issue in MSW. Food waste can cause secondary environmental pollution such as the odor or sewage produced from landfill sites. As food waste that was discharged separately from other wastes increased following the prohibition of direct food waste landfill, and the consumption of fruits and vegetables increased due to the trend of healthy lifestyle, it turned out that the amount of food waste produced increased significantly. The governments pay more attention on the issue. In 1995, the government established the 'Committee for the Management of Food Waste' which involves 8 central agencies, which worked together to take measures for the handling of food waste. Besides, the government began to provide funds to establish public disposal facilities that transform food waste into feed for poultry, compost and bio-mass, and has been promoting the cooperation and participation of citizens to establish a culture of resource recycling in Korean society. In order to establish an eco-friendly food consumption culture, the government pushed local governments, restaurant organizations, and civil or

ganizations to establish a voluntary agreement for the reduction of food waste in 2002. This voluntary agreement has been applied to the entire country since 2003.

In addition, the governments offer financial aids to support new waste treatment facility constructions. Meantime, more and more companies participate in the reuse of household waste including LG, Hyundai, Heavy Industry, Samsung, Heavy Industry and so on. The biggest electric power plant using methane in the world had been completed and put into production in South Korea on Dec 12, 2006. Until the end of 2007, there are more than 40 power plants using methane and over 60 heating stations all over the South Korea, which have achieved significant economic and social benefits.

4. Conclusion

Consequently, since the introduction of the above policies, waste in Korea has been substantially decreased, and waste recycling has been increased. The percentage of recycling has increased from 34.9 in 1998 to 59.8% in 2008. The percentage of landfill decreased from 56.3% in 1998 to 20.3 in 2008, incineration after special treatment from 8.8% in 1998 to 19.9 in 2008 (See Figure 2) .



Source : <http://www.envico.or.kr>

<Figure 2> Changes in Waste Allocations Method from 1998 to 2008
(unit: percentage)

South Korea has managed waste recycling more than 20 years, and has gained great achievements and many experiences to manage waste recycling although it has a lot of difficulties. The relative information and valuable experiences on the waste recycling management will greatly contribute to the improvement of Chinese waste management system, which help our country to practice the view of scientific development, change the view of development, innovate the mode of development and improving the quality of development.

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References

- Chung, Sung-Woo & Rie, Murakami-Suzuki(2008), "A comparative study of E-waste recycling systems in Japan, South Korea and Taiwan from the EPR perspective: implications for developing countries", from www.ide.go.jp/English/Publish/Download/Spot/pdf/30/007.pdf.
- Lee, Seunghae & Park, Hae-Sun(2011), "Korean household waste management and recycling behavior", from <http://wenku.baidu.com/view/142e8ded4afe04a1b071de61.html>.
- Environmental Protection Programs (2011), from http://apec-vc.or.kr/?p_name=database&sort=program&sort2=EP2&goto_page=120&query=view&unique_num=ED2002000192
- <http://www.envico.or.kr>