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Beneficial use practice of e-wastes in Republic of Korea

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Abstract

The EPR system, Eco-Assurance System, and the Allbaro system were examined as the regulation of E-wastes in this study. And beneficial use practice of E-wastes in Korea was introduced to improve recycling activities including collection system and recovery center with facilities. In order to improve the recycling of waste in Korea (Republic of), the act on the promotion of saving and recycling of resources was activated in 1992. Under the act, waste charges and waste deposit fee system were operated for several products from industries to promote recycling measurement. Due to the abolition of waste deposit system in 2002, extended producer responsibility (EPR) system was introduced in 20003 by the amendment of recycling law. Since early 2004, the Ministry of Environment of Korea has carried out a feasibility study to introduce an "Eco-Assurance System (The ECOAS)" which would restrict the use of hazardous substances in electrical and electronic equipment and promote recycling of E-wastes by applying a systemic management for life cycle analysis from cradle to grave. On January 2008, the Eco-Assurance Committee System in Korea has been implemented under the Act on the Resource Circulation of Electrical and Electronic Equipment and Vehicles for resource circulation and environmental conservation in a joint legislation by the Ministry of Environment, the Ministry of Knowledge & Economy, and the Ministry of Land, Transport and Maritime Affairs. According to the ECOAS in Korea, 5 product groups and 27 items of WEEE including refrigerator, personal computer, electric oven, audio, and mobile phone are controlled to intensify the recycling capacity in electronic industries. Beneficial use practice of recycling E-Waste in Korea were examined to improve recycling activities including collection system, recovery center with facilities by the information of E-Waste generation and recycling, policy and regulations of E-Waste. Even though total generation of E-wastes was almost constant recently, the generation trend of TV, refrigerator and washing machine was very increased because those products was used in household more than 2 times for past 10 years. Also, recycling rates of those E-wastes will be increased because recycling technologies have been improved and those E-wastes were readily decomposed by heavy parts.

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1. Introduction

During several decades, Korean industries were significantly developed with improving high technologies to produce electrical and electronic equipment. However, Korean industries always have been suffered by high dependency of foreign energy and resources. Hence, it should be solve those difficulties with high recovery efficiency for energy and resources from recycling of E-wastes.

In Korea, the act on the promotion of saving and recycling of resources was activated in 1992. Under the act with discharge fee and deposit system on waste applying to recyclable products from industries to promote waste recycling. Extended producer responsibility (EPR) system was introduced in January 2003 by the abolition of deposit system on waste in 2002.

EPR system in Korea has been activated under the Act on the Promotion of Resources Saving and Recycling on packaging materials such as metal cans, glass bottles, PET bottles, and plastics, and household appliance products such as TVs, refrigerators, washing machines, air conditioners, personal computers, hi-fi systems, fax machine or mobile phones. Under the Act, the obligation rate of recycling wastes in EPR system has been levied on the association of producers and importers of those products. According to EPR system, the association of producer or the importer should be satisfied the obligation rate of recycling wastes which was decided by agreeing between the government and the association of producer and importer. If the association of producer or the importer does not satisfy the obligation rate of recycling wastes, the producer or the importer should pay the recycling charges with fine by the regulation of EPR system. In Korea, 25 waste items have been controlled by EPR system including 10 items of E-wastes.

By affecting the directives on waste electronic and electric equipment (WEEE) and Restriction of Hazardous Substances, Restriction of the use of Hazardous Substances in EEE (RoHS) in EU, the Ministry of Environment in Korea has studied to phase in the new system for an "Eco-Assurance System (ECOAS)" which should restrict the use of hazardous substances in electrical and electronic equipments and promote recycling of E-wastes by applying a systemic management for life cycle analysis from cradle to grave since 2004¹. The ECOAS in Korea has been activated under the Act on the Resource Circulation of Electrical and Electronic Equipment and Vehicles for resource circulation and environmental conservation in a joint legislation by the Ministry of Environment, the Ministry of Knowledge & Economy, and the Ministry of Land, Transport and Maritime Affairs in 2008. Due to the ECOAS in Korea, E-wastes had been separated from EPR system to strengthen the recycling facilities in electronic industries. The ECOAS in Korea were extended from 10 items of E-wastes in 2008 to 5 product groups and 27 items of E-waste including household small appliances such as electric fan, electric heater, iron, and air purifier, etc. in 2013.

It was examined the generation and recycling of E-wastes, and policy and regulations of E-Waste in Korea. The recycling stream of E-waste was also evaluated. And beneficial use practice of E-waste in Korea was introduced to show recycling efforts including collection program, recovery facilities, and recycling network. Finally it was discussed about the improvement methods for recovery materials from E-waste describing the integrated collection system.

2. The generation and recycling of E-wastes

In Korea, information technology was significantly improved to produce electrical home appliances(EHAs) such as smart TVs, refrigerators, washing machines, mobile phone, and personal computers. And the generation of E-wastes has been increased with increasing the production of EHAs. Also, the recycling of E-waste was concerned to recovery several resources with collecting program.

The generation of E-wastes was slightly increased from 2003 to 2007 and was not increased very much after 2009 as shown in Table 1². Since electric and electronic products were consumed by the effect of economic growth, the stagnation of generation of E-wastes from 2009 was mainly affected by the economic depression in Korea. The generation amount of E-wastes can be represented by national statistics of the production. However, it was very difficult to identify the generation amount of E-wastes because the lifetime of electronic and electric equipment was very long and unauthorized private sector as hidden flow collected E-wastes without any information. The recycling amount and recycling rate of E-waste were increased from 58,000 ton and 12% in 2003 to 158,000 ton and 27% in

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