

特別講演

Status of Pyrolysis Plant Development for Polymer Waste and Related Technologies for Commercialization in Korea

Soo Hyun Chung

*Waste Pyrolysis Research Center, Korea Institute of Energy Research
(71-2, Jang-dong, Yuseong-gu, Daejeon 305-343, Korea)*

Introduction

In Korea, the production amount of plastic resin has come to 9.14 million tons per year. The consumption of plastic products was 3.78 million tons per year and the production of waste plastics mounted up to 2.95 million tons per year.

The collection system of waste plastics in Korea consists of 4 steps such as production, separation/sorting, collection/transport, recycling. The ratio of waste plastics produced from house and industry is more than 90%. The separation/collection system is classified to two ways, administrative organization and private companies. The administrative organization takes charge of collecting only the waste plastics from house. The private companies share the other production sites such as schools, offices, industries. The number of private collection companies is about 4,800. The collected waste plastics are transported to the intermediate treatment companies where separate, compact and transport them for the final recycling. In this process, the more valuable materials are artificially separated from the point of economic view. Accordingly the cost of man power is critical for the mechanical recycling of waste plastics.

Most of recycling companies are included into the mechanical recycling area. The recycling companies for the pyrolysis or the energy recycling are little. In Korea, there are the recycling companies of about 690. Most of them makes the low grade plastic products. Except for these mechanical recyclable plastics, other plastics such as junks are inevitably treated in the combustion system or in the landfill area. The composition of waste plastics produced from the household is: PE 30.2%, PP 26.1%, PS 18.9%, PET 22.2%, others 2.6%. In these waste plastics, PET can be almost recycled in Korea. Especially the waste plastic of PVC component was generated very rarely. The number of companies related to the intermediate treatment and the recycling is about 2,200. The criteria of notification in the waste plastic recycling are based on the mechanical treatment capacity (below 100 ton/day) of the compression, the shredding and the separation. Generally the intermediate treatment companies have the permission from the government for the collection and the sorting of waste plastics. They supply the sorted waste plastics to the final recycling companies. Most of recycling companies belong to the manufacturing industries making recyclable products. The number of processing companies recycling the waste plastic of PP is more dominant than that of processing companies recycling other waste plastics. In case of PET recycling, the number of companies is comparably small, but the treatment quantity is large. This says that the scales of treatment processes for PET recycling is larger than others,

Status of Pyrolysis Technology Developments in Korea

The start-up was done by LG Chemical Company, one of large enterprises in Korea. It introduced the pyrolysis technology from Hamburg University in Germany for the recovery of

monomer waste PMMA which is discarded from its own process. This process was stopped by some difficulties on operation and economic problems after two years trial operation. Most of companies leading pyrolysis technology developments belong to small and medium industry in Korea. They have more lack information on the pyrolysis technologies than large enterprise. It may be difficult for them to get the commercialization step. Fortunately EPR(Extended Producer Responsibility)system was enforced by government from 2003 and the promotion of waste plastic recycling may be expected. In 2005, it is estimated that the production of waste plastics in Korea will reach more than 4 million tons per year. To treat the considerable quantity of produced waste plastics by pyrolysis methods, the compensation from government for the pyrolysis fuel oil should be preconditioned for the purpose of more environmental friendly pyolysis treatment of waste plastics than any other treatment. The pyrolysis technology should be applied with other aspects for more valuable products except for alternative fuel oil from the waste plastics and for the recovery of raw material or the preparation of new raw material, the existent pyrolysis technologies can be upgraded and developed to the new fusion technologies.

Approaches for the Application of Pyrolysis Technologies & The Role of WPRC for National Research Infrast

Waste Pyrolysis Research Center(WPRC) has developed the pyrolysis processes for the treatment of waste tire and polymer waste. In the early 1990's period, the pyrolysis technology development was started for the coal gasification and the oil recovery from waste tire. For more than ten years, WPRC has developed the related pyrolysis technologies from the basic researches to the application steps. On the pyrolysis technologies of waste tire, the detail design data for demonstration plant were acquired. WPRC has the roles as a think tank for the nationally technical support to the environment industries to develop the pyrolysis processes. For the efficient development, three research promotion systems such as co-research teams, application industries and WPRC of central role have been operated. The aim of this project is to get the national research infrastructure for the environmental friendly treatment of waste plastics. This is for the preparation step for the new technologies of next generation. The resources are limited but the new ideas for the recycling technology development are not limited. WPRC has those concepts for the development of basic elemental technologies and for the technical support to the related industries to overcome their obstacles. This will makes the national foundation for the environmental key industries. Accordingly the National Research Laboratory Project (NRLP) will be used for the development of new projects and the new national research infrastructure and the role was undertaken to us. Every year, the jointed workshop with WPRC-universities-related industries is held for the technical communication each other. There are several topics in NRLP for the industrial applications such as the physical/chemical dechlorination from the mixed plastics, the preparation of low cost cracking catalysts for controlling boiling point distributions, the coking control for minimizing coke formation in the reactor, the pyrolysis of thermosetting plastics and the industrial feasibility.

References

1. Korean Institute of Resources Recycling, *A White Paper on Resources Recycling* (1999).
2. S. Kim, *Waste Management*. 21, 609 (2001).