

Evaluation of Plastic Recycling Policy for Suitable Resource Use by Considering Petroleum Products as Joint Products

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1. Backgrounds and Purpose

“Joint product” is defined as a product whose production process is a single one that yields multiple products simultaneously. Petroleum products are well-known as joint products. For understanding the low carbon society, it is necessary to reduce crude oil consumption. For reduction of crude oil consumption, it is necessary to reduce the consumption of specific petroleum products on which consumption of crude oil depends. Thus, resource use efficiency in plastic recycling has been evaluated by index such as recycling ratio. However, it is impossible to evaluate potency for reduction of crude oil consumption because petroleum products are not considered as joint products in the index. The purpose in this research was to develop an evaluation approach for resource use efficiency in plastic recycling by considering petroleum products as joint products. Analyzed statistics is “Energy Statistics Database (by UN)”.

2. Results and Discussion

(1) Analysis on the surplus amount of fossil fuel / Analysis on the resource use efficiency of petroleum products

At the end of 2007, jet fuel, kerosene, residual fuel oil, and other petroleum products (wax, lubricant, etc) was surplus, but in motor gasoline, gas diesel oils, liquefied petroleum gas, and naphtha, demands were exceeding supply. Consumption of crude oil depends on consumption of motor gasoline in the world, in contrast, it depends on consumption of naphtha in Japan. And so, the strategy for high resource use efficiency in the world is different from the one in Japan.

(2) Analysis on the resources used in production of plastic

In Japan, on average from 1996 to 2007, the resources used in production of plastic were coal: 8.3%, kerosene: 2.0%, diesel oils: 0.6%, residual fuel oil: 5.9%, liquefied petroleum gas: 11.0%, naphtha: 67.8%, natural gas liquids: 2.5%, and natural gas (including LNG): 1.8%. Different countries have different proportions of resources used in production of plastic. All countries were divided into seven clusters: natural gas only, natural gas main, naphtha main, naphtha only, coal main, kerosene only, and LPG only.

(3) Analysis on the effect of plastic recycling in resource use efficiency of petroleum products

“Balance Index” in Figure-1 indicates how much difference there is between production and consumption of petroleum products. Smaller column means more suitable resource used. More mechanical recycling and feedstock recycling in Japan leads to 0.15 point higher resource use efficiency in Japan, but leads to 0.01 point lower one in the world.

3. Conclusion

In this research, “resource use efficiency considering petroleum products as joint products” was evaluated by analyzing supply-demand structure of fossil fuel. The evaluation approach developed in this research can contribute to planning and design policy for suitable use of the resources.

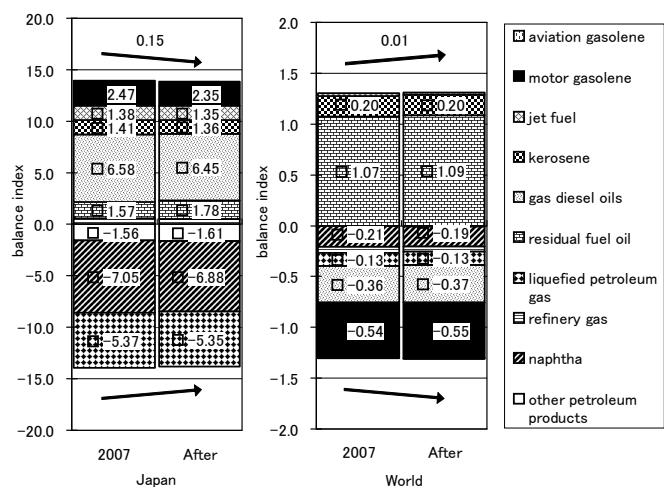


Figure 1 the effect of plastic recycling in resource use efficiency of petroleum products