

PWMI Newsletter

NO 16 1998.9



Plastic Waste Management Institute
JAPAN

Plastic Products, Plastic Waste and Resource Recovery [1996]

Information related to the publication of the Flowchart of Plastic Products, Plastic Waste and Resource Recovery (1996)

The Plastic Waste Management Institute distributes questionnaires every year on matters related to plastic waste recycling. This involves a survey on plastic waste discharge, a survey on municipalities regarding general waste management, and a survey on industrial waste management. The results of these surveys are then collated and published in the form of a flowchart that provides information on plastic products, plastic waste and resource recovery. This is an annual document providing quantitative information on a macro scale related to the degree of plastic production in Japan; manufacture of products from plastic; the extent to which plastic is used or disposed of; and information on disposal and recovery, including ways in which resource recovery is achieved from plastic waste.

The quantities shown in the flowchart are, however, not completely determined by actual investigation, but are in

part estimated from statistical data that has been extrapolated from investigation results and adapted according to particular mathematical formulas.

I Characteristics of the Flowchart (1996)

During the past about ten years since the flowchart was originally published, various improvements and additions have been made.

When the flowchart (1996) presented in the present document is compared with previous flowcharts, the following improvements and additions may be noted.

- 1) While terms related to resin production, resin processing and marketing of products have been simplified, the

breakdown of industrial wastes and general wastes has been explained, in addition to enhancing expressions related to discharge and disposal and recovery.

- 2) Concerning the breakdown of disposal and recovery for general and industrial waste, this institute has been able, on the basis of investigation results, to add information related to incineration with heat utilization facility which was not previously explained. As a result, by adding effective incineration with heat utilization facility (1,130,000 tons with a utilization ratio of approximately 12%), a huge increase in utilization ratio from 25% in the previous year to 39% in the present year has been achieved (this figure is only 27% if not considering bases associated with heat utilization facility).
- 3) The breakdown of resin production by resin varieties, the breakdown of domestic plastic products consumption by field, the distribution ratio of plastic waste discharge by field, and the breakdown of material recycling resources from post-use products related to reclaimed products from general and industrial waste are all newly mentioned in the publication.

II

Explanation of the Construction of each Item in the Flowchart

For the purpose of easier understanding, supplementary notes are provided concerning the elements used in construction of the flowchart publication in addition to the final results used in the flowchart. An explanation is provided so that the process used in preparing the chart and the basis of figures provided in the chart can be readily understood.

(1) Resin Production, Resin Processing and Marketing of Products

1-1 Resin Production :

It has been noted that resin production is constructed from chemical industry statistics provided by the Ministry of International Trade and Industry.

1-2 Reclaimed Products :

For convenience, figures for material recycling provided in the previous year have been used as input for this year. Figures for plastic waste export and import (Ministry of Finance, trade statistics) have also been considered and declared.

1-3 Domestic Plastic Product Consumption :

In order to find the actual product consumption, the following amounts have been added or subtracted.

- Resin Export and Import (Ministry of Finance, trade statistics)
- Liquid Resin and resin for synthetic fiber that fall outside plastic waste discharge (Ministry of International Trade and Industry, chemical industry statistics)
- Plastic Product Export and Import (Ministry of Finance, trade statistics)
- Adjustment for inclusion of products for use in specialized fields

Automobiles have not been included in figures for original plastic products; however, the export and import of automobiles exerts considerable influence over plastic waste discharge in Japan. Classification of amounts of resin used has therefore been conducted according to field demand (estimates from related groups) and revised in the transportation field in accordance with the number of vehicles imported and exported. (Japan Automobile Manufacturers Association, Inc., reports)

· Production and Processing Waste :

Plastic material used in producing below standard products or not effectively used in processing and discharged as waste is taken into consideration.

(2) Plastic Waste Discharge

2-1 Industrial Waste and General Waste :

- Industrial Waste that is a by-product of business activities is subject to the Waste Disposal and Public Cleansing Law. According to government regulations, the disposal of industrial waste is the responsibility of the waste generator. General waste, which is also subject to the above mentioned law, excludes industrial waste, and its disposal is the primary responsibility of municipalities.

2-2 Post-use Product Discharge :

- The amount of resin used is classified according to fields that generate demand (the amount used has been calculated every year for the past 15 years). This amount and the life-span of products in these fields (discharge construction model made by this institute) is taken into consideration to determine post-use product discharge according to an estimation system developed by this institute.
- The discharge ratio of both general and industrial

waste was estimated according to our classification of fields in demand and discharge model.

2-3 Discharge of Resin Production and Resin Processing Waste :

- Resin production and resin processing waste associated with resin production and resin processing, and plastic-product manufacturing waste associated with manufacturing and production in assembly plants, were investigated using a questionnaire on the business of plastic waste recycling, and information was acquired using extrapolation statistics. The amount of waste generated as a by-product in resin production was collated separately.

2-4 Total Plastic Waste :

- This is the total amount of post-use products discharge and resin production and resin processing waste.

(3) Disposal and Recovery of Plastic Waste

3-1 Material Recycling :

- Material recycling amount and its breakdown is estimated by extrapolation from results of a questionnaire given to recycling companies.
- The breakdown of use of material recycling is 850,000 tons of recycled materials (including 150,000 tons of export : Ministry of Finance, trade statistics), and 180,000 tons of recycled products. Here, recycled materials include pellets, flakes, fluff, blocks and ingots, and recycled products include types of film sheet, stakes and piping, etc.

3-2 Utilized Amount in the Form of Densified Refuse Derived Fuel and Liquefied Plastic Waste :

- Data from the questionnaire on recycling targeting Densified Refuse Derived Fuel or Liquefied Plastic Waste were converted into figures for plastic.

3-3 Disposal and Recovery of General Waste :

- Treatment by Incineration / Disposal by Land Filling
Using other investigations conducted by this institute to date, a comparison was made between incineration and land filling by municipalities.
- Incineration with Power Generation
Treatment by incineration by municipalities includes power generation. In order to calculate this ratio, results from the present investigation were used.

• Incineration with Heat Utilization Facility

Treatment by incineration by municipalities includes incineration having external heat utilization facilities but having no power generation. In order to calculate this ratio, results from the present investigation were used.

3-4 Disposal and Recovery of Industrial Waste :

- Disposal and recovery of industrial waste is partially commissioned to the municipalities involved. The ratio of this process by waste management business against that by municipalities is calculated according to the results of the present investigation.
- Concerning the ratio of treatment by incineration by municipalities against that of land filling and the ratio of energy recovery such as power generation, the same predictions are made in relation to general waste materials.
- The ratio of incineration and land filling by industrial waste management contractors is calculated according to results of the present investigation.
- Ratios of energy recovery such as power generation from incineration treatment of industrial plastic waste are based on the results of the present investigation.
- Incineration with heat utilization facility :
The ratios of heat utilization by municipalities and by industrial waste management contractors involved in treatment of industrial waste by incineration are calculated according to the results of the investigation done by this institute.

III

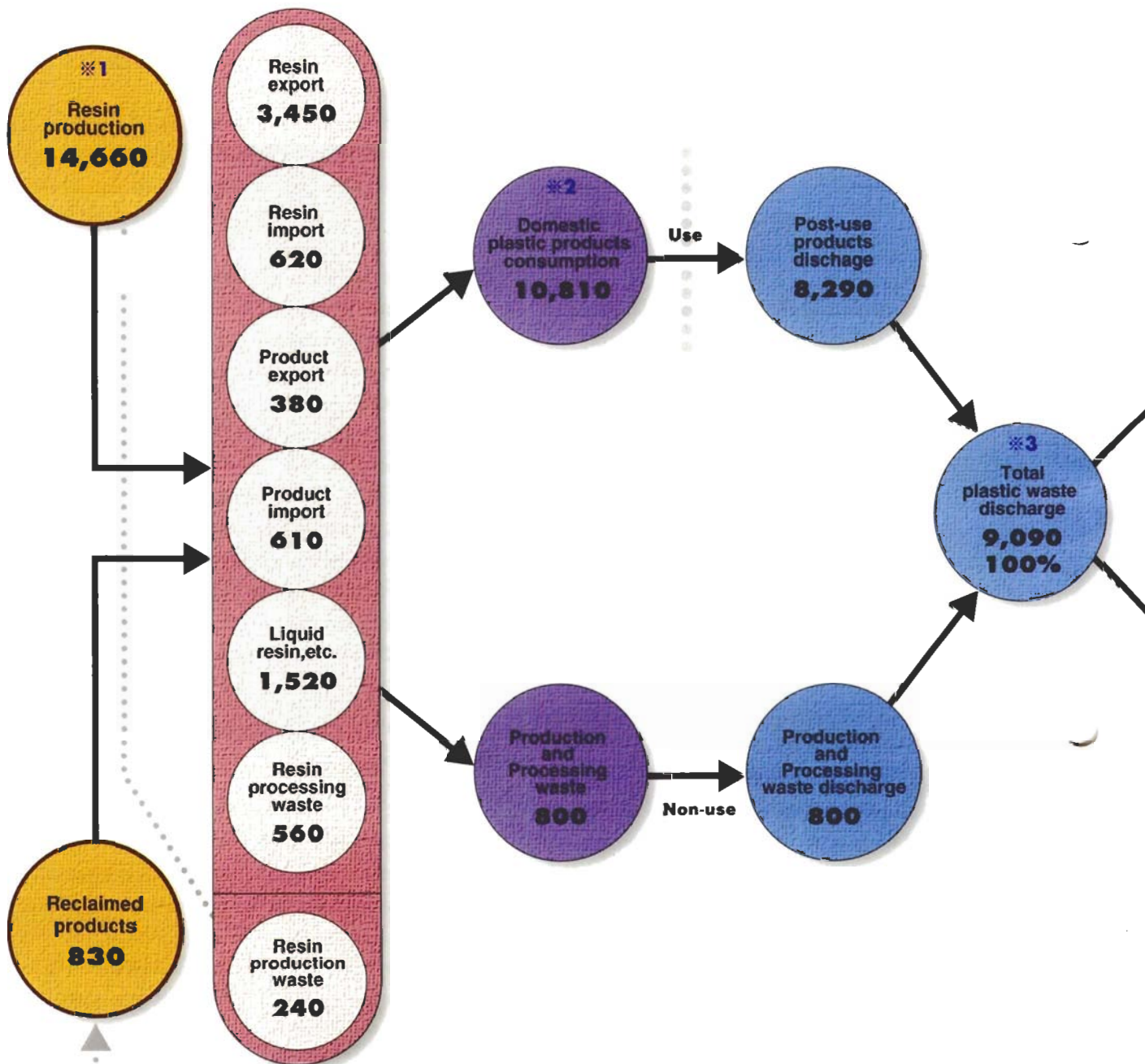
Summary

The flowchart (1996) presented here includes the addition of incineration with heat utilization, and this and other factors has increased the utilization ratio of plastic waste from 25% in the previous year to 39% in the present year. In the future, there should be even more possibilities for recycling containers and packaging by law and making such post-use products into new commodities such as oil, densified refuse derived fuel, and raw material for blast furnaces. More information should also be made clear in further investigations concerning incineration and energy recovery by municipalities and on factory sites. We can expect to see an increase in the amount of utilized waste as such programs continue to advance.

Flowchart of plastic products, plastic waste and resource recovery (1996)

[Unit; thousand ton]

Resin production, Resin processing and Marketing of products **Discharge**



For the sake of convenience, the quantities for reclaimed products for this year are based on quantities of material recycling from the previous year.

Disposal and recovery

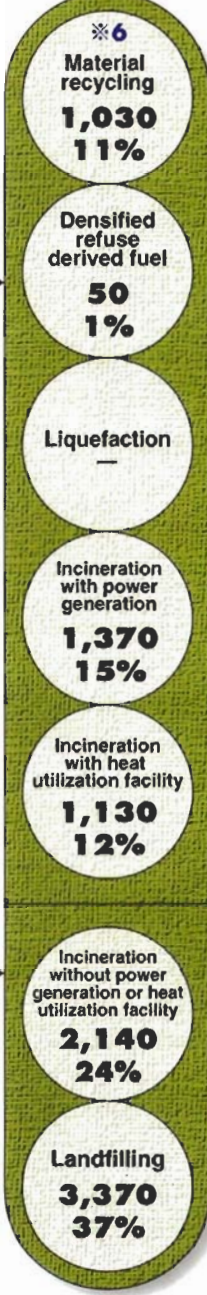
General waste



Industrial waste

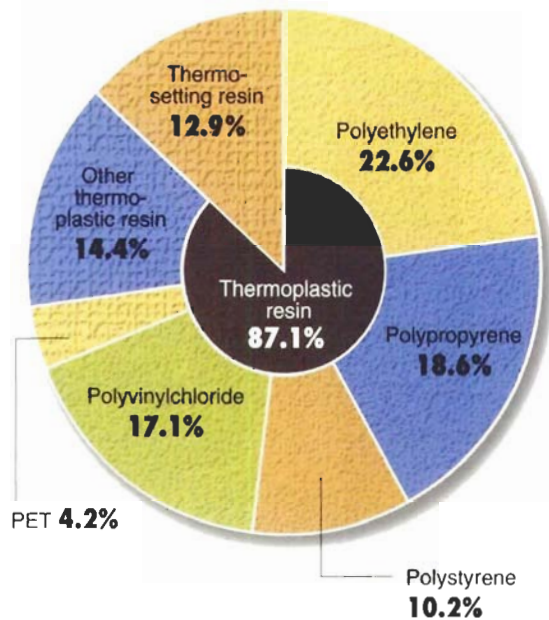


Sum of waste



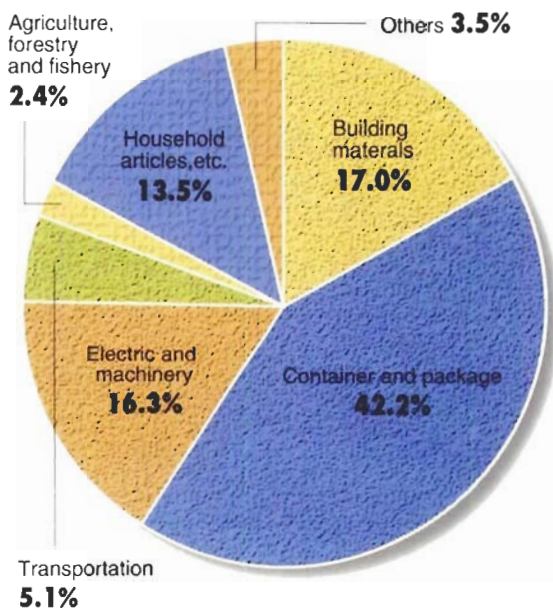
Details of construction elements in flowchart

※1 Breakdown of resin production by resin varieties (14,660 thousand ton)



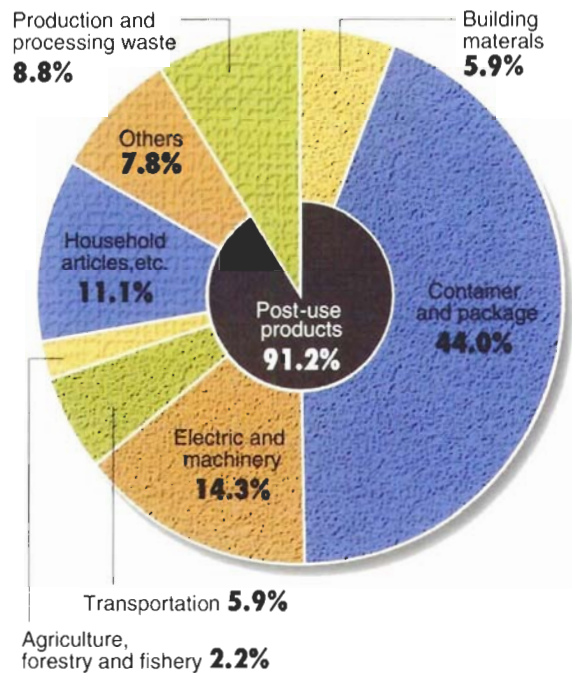
(Source : MITI's chemical industry statistics)

※2 Breakdown of resin products by field (10,810 thousand ton)



(Source : Estimations by groups concerned, etc.)

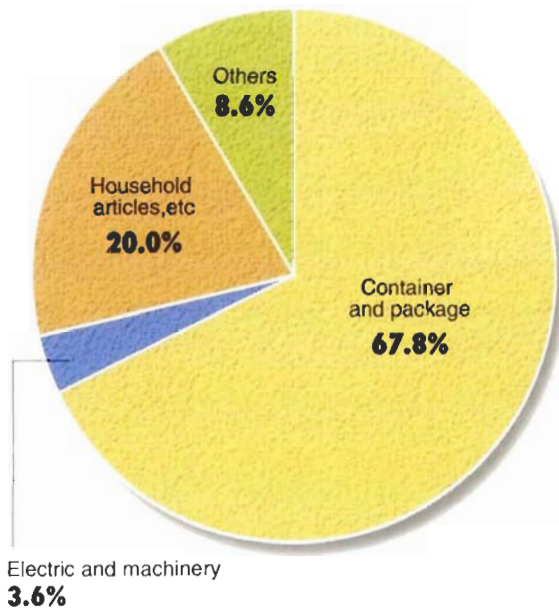
※3 Breakdown of total plastic waste by field (9,090 thousand ton)



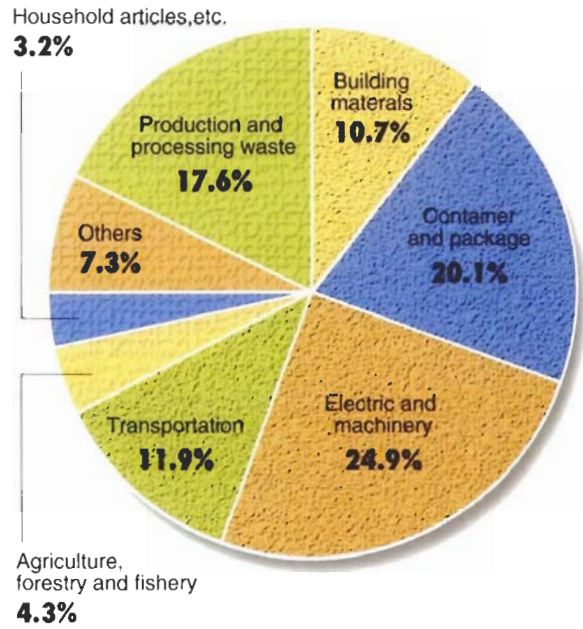
※6 Breakdown of material recycling (1,030 thousand ton)



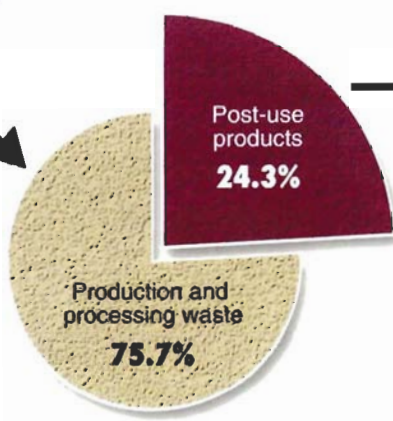
※4 Breakdown of general waste by field (4,550 thousand ton)



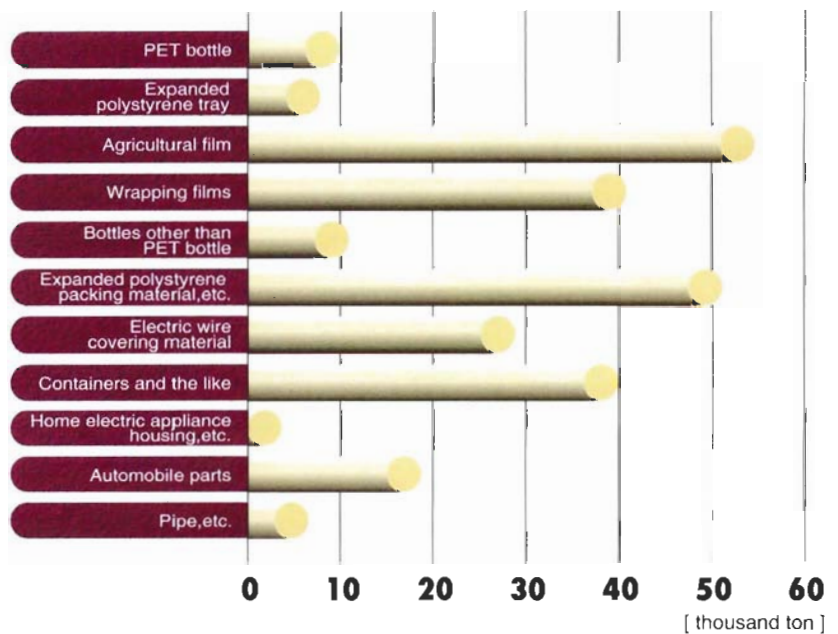
※5 Breakdown of industrial waste by field (4,540 thousand ton)



● Material resources of recycling (1,030 thousand ton)



● Material resources of post-use products (250 thousand ton)



Plastics production and waste discharge

Year	Resin production	Basic quantity for calculating plastic waste discharge *	Total plastic waste discharge	General waste		Industrial waste	
	1,000 t/year	1,000 t/year	1,000 t/year	1,000 t/year	%	1,000 t/year	%
1975	5,170	3,150	2,610	1,470	56	1,140	44
1980	7,520	5,520	3,250	1,780	55	1,470	45
1985	9,230	6,990	4,190	2,320	55	1,870	45
1986	9,370	7,300	4,530	2,500	55	2,030	45
1987	10,030	7,920	4,650	2,600	56	2,050	44
1988	11,020	8,610	4,880	2,760	57	2,120	43
1989	11,910	9,570	5,060	2,910	58	2,150	42
1990	12,630	9,990	5,570	3,130	56	2,440	44
1991	12,800	10,070	6,220	3,450	55	2,770	45
1992	12,580	9,280	6,920	3,910	56	3,010	44
1993	12,250	9,020	7,560	4,190	55	3,370	45
1994	13,040	9,660	8,460	4,230	50	**4,230	50
1995	14,030	9,790	8,840	4,430	50	4,410	50
1996	14,660	10,810	9,090	4,550	50	4,540	50

* (Basic quantity for calculating plastic waste discharge) = (Resin production) - (Product export) + (Resin import)
 - (Liquid resin, etc.) - (Resin processing waste)
 + (Reclaimed products) - (Product export) + (Product import)

** From 1994, the estimation method was changed. non-use resin production waste and resin processing waste were added to figures for the industrial waste.



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