

# PWMI

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### Chairman Message: Two Decades after the PWMI Foundation

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Since its foundation in November 1971, the Plastic Waste Management Institute has continued constant efforts for promoting adequate disposal and/or recycling of waste plastics in the hope to contribute to the sound development of the plastics industry. Two decades have passed and the PWMI had its 20th anniversary last November.

Looking back a score years ago, the favorable economy afforded vigorous production activity, and total plastics output outpaced five million tons for the first time in 1970. On the other hand, surging plastic wastes, partly due to insufficient disposal technologies and systems, have become a big social problem, causing some to call for restriction on the plastics use. Such being the situations, the petrochemical industry, among others, voluntarily established the PWMI to help solve the problem by endeavoring for the development/promotion of plastics recycling/disposal technologies, including incineration.

In recent years, waste problems have been highlighted again in our society, but circumstances have drastically changed in several points since the days of the PWMI formation. First, recent waste problems have been taken as part of global environmental issues. Now that affluent living enjoyed by the peoples in developed countries arouses growing concerns for wasteful use of resources, environmental pollution, etc., many started arguing that future generations should be taken into account in our producing/consuming behaviors. In this context, besides the promotion of adequate waste disposal, the needs for resource conservation as well as resource recovery are hammered out in the forefront of the efforts to counter waste problems too.

Thanks to its outstanding characteristics as viable materials, plastics are put to wide use in industrial activities and our daily life. Focusing on post-consumer plastics, the PWMI hopes to give them the second life as viable recycled resources, thus helping establish a total life cycle of plastics, where the so-called "from cradle to grave" concept becomes real by achieving optimalization of plastic materials in universal terms.



Chairman at the 20th Anniversary



Reception Party of the Anniversary

# Energy Recovery from Plastic Wastes: An Interim Report

In February 1991, the PWMI newly formed the Committee for the Promotion of Energy Recovery from Plastic Wastes, which consisted of representatives from academic circle, national and municipal governments, incinerator makers and plastics-related manufacturers, among others. The creation of the committee was motivated by a brief that energy recovery was among the most viable methods to put post-consumer plastics in municipal waste streams to effective use. In November 1991 the committee released an interim report. Part of the report, primarily plastics-related portions, is summarized below.

## Energy recovery from wastes

In fiscal 1988 about 48 million tons of municipal solid wastes were generated in Japan. Given that their heat value averages 1,800 kcal/kg, that amount of municipal wastes provides equivalent energy resources of 9.3-million-kl crude oil, with a liter of crude oil assumed at 9,250 kcal. Also, assuming that post-consumer plastics in municipal waste streams have an average heat value of 7,800 kcal/kg, 2.76 million tons of post-consumer plastics in the waste streams are equivalent to 2.30 million kl of crude oil.

Energy recovery methods from wastes are roughly grouped in three: (1) produce fuels directly from wastes (RDF or refuse-derived-fuel); (2) recover incineration heat, which is used as heat supply sources (in such forms as steam, hot water, hot air), and (3) generate electricity by steam resulting from heat recovery.

Though commercialized to some extent, RDF production has not yet become popular largely due to limited fuel markets. Supplying exhaust heat outside is popularly in practice at a number of municipal waste incineration plants. What is noteworthy is that many of such projects are provided for free of charge to nearby community installations, like heated swimming pools and welfare centers, as part of municipal services.

In Japan waste incineration plants capable of producing electricity number some 100 at present, with an additional 30 slated to be built by late 1994. They represent a mere 5% of total number of waste incineration plants. But, in terms of incinerating capacity, they are responsible for some 30% of the whole. Their generated output totals about 300 MW. Of them, 46 plants (producing 220 MW in total) are selling electricity to utilities.

## Concept of energy recovery from plastic wastes

Post-consumer plastics in municipal solid waste streams are handled differently by different municipalities. Namely, roughly grouped in two, some municipal governments collect and inciner-

ate plastics together with other municipal wastes, while others designate plastics as incombutibles subject to separate collection and for landfilling.

Incineration of post-consumer plastics together with other municipal wastes is noteworthy in many points. For instance;

- (1) Comprehensive measures can be taken in the general flow of municipal disposal.
- (2) Energy recovery at municipal waste incineration plants has already been put to practical use in such forms as district heating and RDF electricity generation.
- (3) Employed in seven out of the 12 largest cities, incineration of post-consumer plastics together with other municipal wastes has been proved viable in many cases.

Even when plastics are designated as incombutibles and subject to waste separation, energy recovery is possible by segregating plastics from the streams of separately collected incombutibles, then burning them in a specially-designed plastics incinerator or processing them into RDFs. A combination with RDF-fired electricity generation or heat supply installations is also possible.

This approach is noteworthy in following points.

- (1) Existing waste separation system agreed between municipal offices and citizens, if any, can be left intact.
- (2) Segregation of plastics from separately collected waste streams, followed by their incineration, was once demonstrated in Tokyo.

A problem is that this approach requires new plants, one to segregate plastics from separately collected waste streams, and the other to incinerate segregated plastics, thus pushing up waste disposal cost high.

## Tasks to help promote energy recovery from plastic wastes

To facilitate incineration of plastics for energy recovery sake, technical development efforts are needed mainly from two aspects.

One is the development of new incinerators specifically designed for plastics-containing wastes, and the other is improvement of efficiency of energy recovery.

In regard to new incinerators under development, suspending burning and fluidized-bed combustion, among others, appear promising.

Efficiency of energy recovery among existing municipal waste incineration plants is not necessarily high. Focusing on the 12 largest cities alone, it ranges from around 30% at highest to a mere 10% at lowest. As around 80% of energy is recovered from steam generated by the boilers equipped with waste incinerators, using the steam more effectively requires technical development efforts to improve efficiency of heat use.

### Roles of the plastics industry

As principal measures to deal with plastic waste disposal, the plastics industry has already been promoting source reductions as well as recycling. Nevertheless, in regard to post-consumer plastics ultimately entering municipal solid waste streams which should

be disposed of, the industry is required to help map out how to encourage incineration/energy recovery in waste disposal system operated by municipalities. To this end, not merely indirect cooperation in technical and financial terms but direct involvement in plastics disposal in such forms as joint projects with municipalities will be needed.

### Waste Disposal Law Amended and Recycling Law Enacted

With the Waste Disposal and Public Cleansing Law amended and the Law for the Promotion of the Use of Recycled Resources enacted, fiscal 1991 marked an epoch-making year for waste disposal/resource recovery in Japan.

First, the amended Waste Disposal Law requires waste disposal plans be made by business operators and, in this context, empowers authorities to instruct those who generating large amounts of wastes to prepare plans for waste disposal and volume reduction, when necessary. Also, under the amended law, explosive, toxic, infectious and other hazardous wastes to human health and living environment are grouped in a newly created category of "wastes requiring special management" subject to stricter management paired with enhanced efforts to arrange their disposal system. Particularly in regard to industrial waste disposal, given that private waste haulers face growing difficulties in siting disposal facilities, the amended law hammers out several new measures, including a policy to help install third-sector-based waste disposal centers nationwide.

The most significant point is that the amended law articulates the importance of volume reduction and recycling. The basic concept embedded in the original Waste Disposal Law stressed adequate disposal of wastes, which has become increasingly hard due to not merely growing and but diversifying wastes. That's why the basic concept was switched over

to new one calling for source reduction and resource recovery efforts.

But, any recycling efforts should end in vain without good mechanism to put recycled resources to effective use. Having acknowledged this point, the MITI proposed a bill to help promote the use of recycled resources. The MITI's bill, enacted later, intends to encourage business operators to use recycled resources as their feedstocks. To this end, the law mentions specific products to be recycled, and empowers competent ministers to take necessary actions to encourage business operators to make such recycling efforts. Also, the law mentions specific products to be labelled to make waste separation easier for recycling purposes, and empowers competent ministers to recommend business operators to observe such requirements. In addition, to promote the reuse of by-products at plants, etc., the law authorizes competent ministers to make necessary instructions, advices, recommendations, and the like. In this way, the newly enacted law puts forth the basic policy to encourage the use of recycled resources among manufacturers and distributors.

To sum up, with recycling acting as the point of contact, the newly established close link between waste disposal and industrial administrations characterizes the latest legal moves best.

# Recycling of Foamed Polystyrene and PET Bottles

Reflecting intense fears for rising waste disposal needs, gathering society-wide is momentum to call for source reduction and resource recycling. Under such circumstances, one-way products are now caught in the crossfire among consumers. Particularly, plastic packaging and containers are picked out as typical one-way products, arousing demands for bans on their use and substitution to alternative materials. Given progressing efforts to recycle paper-made milk containers, cardboard boxes, glass bottles, and aluminum and steel cans, throw-away plastic packaging/containers are receiving severer criticism ever.

To counter such situations, the plastics industry also started committing to recycling efforts, particularly foamed polystyrene at one hand, and PET bottles at the other.

## 1. Food trays

As typical troublesome one-way products, consumer organizations cite food trays, very popular packaging employed by supermarkets, etc. which are thrown away every day from general households. The trays are generally made of foamed polystyrene paper. In addition to its throw-away life, foamed PS is denounced for its bulkiness. Such being the situations, the foamed PS paper industry started experiments to collect and recycle their products under cooperation with consumers and supermarkets. Namely, under the leadership taken by the Society of Foamed Polystyrene Sheet Manufacturers, experimental collection of foamed PS trays was initiated in various spots, while recycling plants were built and put onstream in Tokyo and Osaka areas.

Also, some food plastic tray maker, jointly with supermarkets, started a used tray collection program. Consumers taking used trays back to supermarkets gain a coupon. Coupons are valid only at the supermarkets they are issued to promote tray collection.

Some supermarkets, on their part, have installed at corner of their stores specially-designed small units to compress foamed participants at the onset. Used trays collected under the program

are forwarded to the maker's recycling plant, where they are recycled into secondary pellets.

Some supermarkets, on their part, have installed at corner of their stores specialloy-designed small units to compress foamed PS trays to ingots, which are about one 50th of their original volume. Because plastic trays are replacable by no alternative packaging for supermarkets characterized by self-service, to demonstrate their recyclability becomes a plausible means to thaw out criticism against throw-away trays. At the same time, this approach provides tray makers with a key sales point.

Among others, foamed polystyrene products include fish containers and buffers used in containing white goods. In May 1991, the Japanese Association of Foamed Polystyrene Industry and resin makers established the JEPSRA (Japan Expanded Polystyrene Recycling Association) to help (1) promote collection and resource recovery of white-goods used packaging and other molded products, and (2) encourage recycling efforts at major fish wholesale markets by recommending installation of recycling units and sharing part of their operating costs. The JEPSRA started planning establishment of a recycling plant, while having already installed collection centers in Tokyo and Osaka.

## 2. PET bottles

To gain some date for recycling, now under way in Ibaragi near Tokyo and Hyogo near Osaka are PET bottle recovering tests, sponsored by the PET Bottle Council consisting of resin makers and processors. Also a scheme to recycle used beverage bottles is under planning at a 5,000 ton/year model plant.

Moreover, the PET Bottle Recycling Coordination Committee, formed jointly with beverage makers, has a plan to encourage consumers to become more recycling-conscious. Among others, the basis for greater collection/recycling efforts is steadily bolstered by prompting the use of common marking/labelling and supporting designated recycling business operators.

