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PLASPIA in JAPAN

Thermal Recycling

Plastics waste disposal approaches can roughly be divided into four; material recycling, thermal recycling, incineration without energy recovery (simple incineration), and landfilling. While each has its own features, thermal recycling has become increasingly popular these days in reflection to shortening availability of landfill sites and growing calls for the use of untapped energy of wastes.

In particular to practise effective energy use, plastics waste recycling plans are under way to recover thermal energy from waste incineraction process, and use it in electricity generation and/or heat supply.

Thermal recycling/effective utilization plans take various forms. In populous urban areas, electricity generation from energy of waste incineration and heat supply will be in practice. In too sparsely-populated areas to permit electricity generation from energy of wast incineration, a wide-area/general energy use plan, like heat supply, will be prepared.

Plastics Waste Energy Attracts Both National and Local Officials

Thanks to outstanding characteristics (inexpensiveness, light-weight, corrosion resistance, easy fablicating, etc.), plastics are so widely in use that they should be regarded indispensable for contemporary life. Once discarded, however, plastics unveil some problems; a heap of post-consumer plastics, which are hard to decompose, and of which high-heat value plastics waste need to reduce in volume so that the incinerator's temperature inside should not rise too high, when burned in conventional incinerators.

But, from the viewpoint of untapped energy utilization, waste can be counted as a "highly potential urban energy source." Particularly, given their high heat values, plastics waste can no longer be regarded as troublesome. On the contrary, they are most promising among untapped energies.

From such a standpoint, there are growing moves toward efficient energy use through electricity generation/heat supply by virtue of energy of waste incineration.

This issue portrays an overview of what policies are taken by national and local governments involved in waste-derived energy recovery/utilization.

Waste Incineration Plants to Generate Electricity in Limelight

— Ministry of Health and Welfare (MHW) —

MHW's "Study Group on Effective Use of Surplus Heat from Waste Incineration Plants" stated in its report, prepared two years ago, that electricity generation was in practice at 102 waste incineration plants as of late 1991 and that, two decades later, their combined generated output could be increased tenfold or more to an estimated 3.4 GW.

This report described that a total of 1,900 municipal waste incineration plants nationwide utilized surplus heat in some ways, typically hot water supply. Some plants also supply surplus heat to neighboring public facilities for hot water supply or air conditioning, to heated swimming pools, or to melting snow on roads.

It is also reported that, of about 400 fully-continuous incineration plants running for 24 hours, 102 plants are equipped with generators having a total capacity of 320 MW. If the 400 plants all were equipped with generators, total generated output could amount to 2.5 GW, and to 3.4 GW in 20 years later, the report added.

The plants currently committing to electricity generation can reduce their operating cost thanks to saving the purchase of electricity and the sale of surplus electricity to electric power company. Moreover, if 60% of potential energy contained in wastes could be recovered, Japan's 6-day crude oil demands could be covered. This could help reduce CO_2 emissions, among many other merits.

MHW, keeping in close contact with relevant government offices, as well as local governments, intends to map out more specific plans to use surplus heat from waste incineration.

Super-Waste Electricity Generation Deserved Much Expectations

— Ministry of Home Affairs (MHA) —

MHA's "Study Committee on the Promotion of Community Energy Projects" (chaired by Prof. Ken Hirata, Shibaura Institute of Technology) examined how to effectively use untapped energies, like surplus heat from waste incineration, particularly how to help promote electricity generation at incineration plants run by local governments. In its study report, the committee forecast that generated output at such waste incineration plants would amount to around 4 GW, equivalent to 3 ~ 4 nuclear power plants.

At present, of muncipal waste incineration plants currently in operation, those equipped with generators amounts to about 5% in the number of units, and to some 33% in incinerating capacity. But, partly due to poor efficiency of energy use, about half of such generating facilities produce electricity as much as barely meeting in-plant needs. But, new capacity, to be installed ahead to replace existing one, is expected to be large enough to allow the constant sale of surplus generated output to outside.

In this context, in an attempt to increase generating efficiency and permit more effective utilization of surplus heat from waste incineration, successful efforts are under way to establish a practical system to put untapped energy, namely energy of waste, to effective use by employing a heat engine, which can increase temperature of the steam produced at a incineration plant high enough to drive an efficient steam turbine. This heat engine-based efficient system to generate electricity from energy of waste is called "Super-Waste Electricity Generation."

Super-Waste Electricity Generation, once established, has various advantages: ① It can improve generating efficiency to 20 ~ 25%, compared with 10 ~ 15% expected from conventional systems; ② It can be installed outside an incinerator which is not equipped with an generator now, thus broadening options; and ③ Thanks to its double heat-source systems, electricity generation and heat supply can be ensured to meet minimum necessary needs even if one of the system is down due to periodical inspection, etc.

Super-Waste Electricity Generation, if introduced by many local governments, not merely leads to effective utilization of untapped energy of waste, but also produce a wide range of merits, from saving of such fossil fuels as coal and oil to alleviation of global warming and new funds raised from the sale of electricity.

Energy Community Plan Taking Shape

— Ministry of International Trade and Industry (MITI) —

So far the MITI has approached plastic waste recycling mainly from two angles; material and thermal recycling. On top of these, given that material recycling requires additional needs for energy and cost in the processes of removing foreign matter, separating heterogeneous plastics, cleaning contamination, etc., development of extra-cost-free systems is under consideration. Also, because the promotion of material recycling involves manifold subjects, including construction of such a new social system as waste separation and development of recycled product markets, thermal recycling is now emerging as a preferable direction.

With thermal recycling, even plastics waste inappropriate for material recycling, due to foreign matter, heterogenuous plastics, contamination, etc. which can hardly be taken away, can be put to effective use in the form of valuable energy source.

Advantages of thermal recycling are diverse and include ① effective use of untapped energy, ② waste volume reductions, ③ elongation of the service life of landfill sites, and ④ virtually unconditional acceptance of waste without separation, sorting, decontamination and the like required. Instead of simple incineration of plastics waste, thermal recycling provides waste incineration of energy recovery type. To promote this approach requires various efforts, such as to increase efficiency of electricity generation from waste, facilitate introduction of cogeneration, and examine how to create demands for electricity/heat resulting from thermal recycling. Namely, thermal recycling has its own subjects, some involving R&D efforts, and others construction of new energy utilization systems.

In specific terms, to deal with plastics waste found in municipal waste streams, the MITI plans to ① encourage electricity generation from energy of waste in populous urban areas, particularly efficient electricity generation in metropolitan areas, ② organize wide-area waste disposal to enable electricity generation by burning wastes among less-populous urban areas, ③ prompt the use of waste-derived energy in the form of heat, like heat suply, particularly in local cities too small in size to justify thermal recycling in the electricity form, ④ put plastics-rich waste in the communities, where waste separation is in practice, to efficient energy use by burning them together with industrial plastics waste.

As for plastics waste from industrial sources, promising options include district energy supply service, energy recovery by burning waste, energy recovery in the form of electricity from waste incineration, production of solid fuels, and pyrolysis to fuel oil.

"Environment Benign Type" Directed

— New Energy and Industrial Technology Development Organization (NEDO) —

With budgets appropriated by the MITI, the NEDO plans to subsidize construction of efficient installations designed to generate electricity from waste.

PWMI, on its part, formed a concept of "Energy Community" consistent from supply to demand. This concept is based on the idea that thermal recycling to recover energy from waste can be the best option for the present, but more far-reaching thank to additions of "plastic-waste collection/prior treatment systems" as well as "thermal/electrical energy utilization systems" to "incineration energy recovery systems."

For instance, it is suggested that, in a metropolitan of around a million citizens where plastics waste from households amount to an estimated about 20,000 tons/year, 10% of the plastics waste needs to be collected to drive a system designed for drying/incineration alone, and that as much as about 30% needs to be collected if electricity be generated.

PWMI to continue FS supports

Given a number of technical/economic questions remaining unsolved, to make an "Energy Community" real requires united efforts among the concerned all. A feasibility study conducted under close cooperation of the PWMI shows that plastics waste represent a high-calorie energy source, and that it is possible to form a system to take the rich energy content out and supply it to a given community. PWMI intends to continue its cooperation in additional FS efforts.

Ecotopia Plan Constantly Under Way

— Environment Agency —

Under its Ecotopia 2000 Plan, which calls for model projects to demonstrate general measures to help arrest global warming, the Environment Agency designates areas subject to model projects, and designated areas start qualified projects for the EA's subsidy.

To date Cities of Osaka, Kobe and Koshigaya have been designated. Principal measures employed in their projects are the use of exhaust heat, cogeneration, and community-wide heat supply from conventionally untapped energy sources.

The "National Conference of Municipalities Concerned over Resource/Energy Problems" (chaired by ex-Prof. Yasuo Yamaguchi, Tokyo Metropolitan Univ. of Science and Technology), which consists of municipal officials responsible for environmental/waste disposal affairs, is now preparing a project to use municipal wastes in the effort to activate communities, and calling for participation of firms and hospitals in the project.

It is a project to build waste incinerators to burn plastics waste, among others, in a site covering an area of about 100 ~ 150 hectares, where leisure installations like a heated swimming pool, welfare/medical facilities for senior citizens like a spa-equipped health care center, and a small/medium-sized industrial complex are also located. Construction cost is expected to total some ¥30 billion.

Compatible-with-Environment Models Unfolded

— *Ministry of Construction (MOC)* —

Under its Eco City Plan, a concept to build model cities compatible with environment, the MOC designates some municipalities as model cities. Designated municipalities are required to prepare urban environment plans to systematize urban environmental measures and set priorities among them.

In fiscal 1993 Cities of Iwaki, Ohmiya, Funabashi, Yokohama and Kita-Kyushu were designated.

Principal measures in their plans include the use of exhaust heat, electricity generation from energy of waste, and waste recycling in other forms, thus confirming that energy recovery from waste incineration is planned as the core of their schemes.

Need for Financial Aids Called for

— *National Association of Mayors* —

In June 1993 the NAM prepared recommendations on urban environmental issues, primarily on waste problems. In the report, the NAM announced results of its examination about how to help promote efficient electricity generation from waste-derived energy and install facilities where surplus heat from a waste incineration plant could be put to best use. Specific themes included construction of large-sized facilities from a broad viewpoint and incineration of plastics waste having high heat values.

In regard to management of an incineration plant, the NAM concluded that it would be essential to have the plant equipped with generators and incidental facilities where surplus heat could effectively be in use, and that it would be worthy to consider incineration of, not merely municipal waste in general, but plastics waste so badly contaminated that their ordinary recycling should hardly be expected, among others, so that their high heat values could effectively be recovered.

To this end, financial aids by the national and prefectural governments need to be provided to upgrade relevant facilities, the NAM adds. Also, mayors propose to review waste anew from the aspect of global environmental protection, and establish an economic system of circulating type where waste can effectively be recycled.

Big "Health Care Lands" Getting Rooted in Communities

— *Cases of Saitama Pref. and Sakai City, Osaka Pref.* —

The Eastern Saitama Sanitation Association, consisting of four cities and two towns in Saitma Pref., including Cities of Koshigaya and Soka, is building a ¥40.5-billion waste disposal facility to be completed in 1995. The big facility is equipped with efficient capacity to generate electricity from energy of waste. Outrunning the concept of conventional waste incineration plants, the facility abuilding will serve as an energy terminal to supply electricity, heat, etc. It looks ultra-modern in external appearance, and adjoins athletic facilities for citizens, such as a ground and a swimming pool.

The "Super Waste Incineration/Electricity Generation Complex" in Sakai City, Osaka Pref. is capable of incinerating waste of 460 tons/day, and designed to drive a gas turbine of 4 MW at maximum. Exhaust heat from the turbine is used in heating 300°C steam, which generates from the incinerator, to about 380°C. Then, a steam turbine is driven to generate electricity. Total generating capacity is about 16MW.

As demonstrated by these two examples, moves are growing nationwide to recover energy from waste, and put it effective use in citizens' life.

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