Ebara Works for Sustainable Development

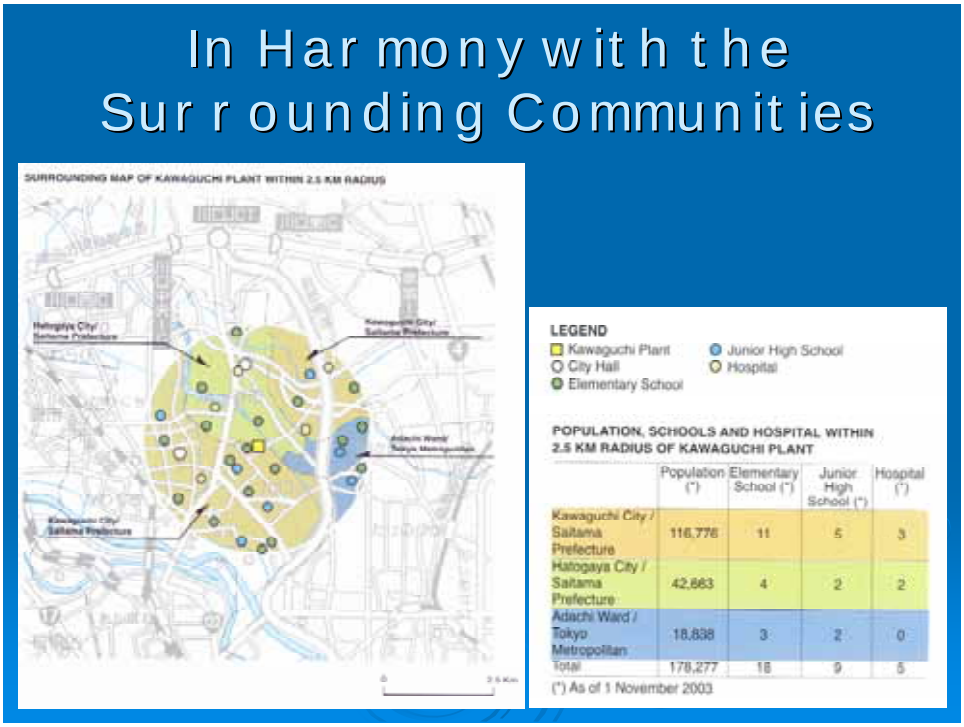
We are grateful to the Friends of the Earth (HK) (FoE) and its guest Setsuko Yamamoto for their comments on incineration and for giving us an opportunity to respond and clarify our stance.

In relation to our incinerators, Ms. Yamamoto commented, "It was divulged several years ago that the Ebara Company, visited by Mr. J C Kwok (the newly appointed Director of EPD), had an accident. Its Kanagawa incinerator south of Tokyo had emitted dioxins and toxic heavy metals thousands of times higher than the standards for eight years since it was completed in 1992". Ms Yamamoto was correctly referring to an extremely unfortunate problem discovered on 23rd March 2000 in the company's Fujisawa Plant. This small-scale conventional incinerator, with a capacity of 10 ton/d, had been releasing *waste water* containing toxic substances over a period of seven years.[1] This facility is located in the company's own factory and is used for tests and research. The problem was due to a contractor's error in the connection of pipelines at the construction stage and was not a problem with the technology. It was a case of negligence caused by a very elementary mistake in quality control and the management's failure to monitor the small quantities of waste water discharges. Ebara took the matter very seriously and responded in a transparent manner by dismissing the Chief Environmental Officer and Chief Construction Management Officer, announcing preventative measures to ensure no repeat of the incident, and declared corporate efforts to establish thoroughgoing environmental measures. All management and staff have been working earnestly since to minimize the impact of the accident and to regain the confidence of the public. Ebara has reaffirmed the tenets of our corporate philosophy [2] and stress again our pledge to sustainable development and our promise for the best service.

Ms. Yamamoto mentioned, "the newly appointed Director of EPD, Mr. K K Kwok visited local incinerators in Japan last year, and was profuse of praise". One of Ebara's facilities on the visitor's schedule was *a gasification furnace* in the Asahi Clean Center with recycling plaza. In contrast to conventional incineration which burn fuels to ash, *gasification* is a process that converts solid or liquid stocks to a gaseous fuel, synthetic gas (syngas), through partial oxidation at relatively low temperature. Gasification is an old and established technology invented in 1792. Commercial coal gasification was used extensively in the 19th century and provided cities with town gas for domestic consumption and streetlights. Gasification continues to be developed and has recently undergone renewed success due to novel approaches for the destruction of unwanted residues whilst producing useful byproducts such as electricity, steam, hydrogen and synthetic fuels. Fuels such as coal, metropolitan solid waste (MSW), heavy residues and petroleum cokes inherently contain a significant amount of contaminants like sulfur, nitrogen and heavy metals which makes direct combustion in a conventional power station or incinerator environmentally unacceptable. These fuels can be converted to syngas through gasification. Gasification is the key to *clean combustion*. Gasification offers reduced emissions, higher efficiency, flexibility and advantages in reliability, availability and maintenance (RAM) performance. The technology stands to break the next barrier through the use of low-value fuel stocks for generating power. Integrated Gasification Combined-Cycle (IGCC) is a breakthrough for power generation using coal and Integrated Gasification & Ash-Melting (IGAM) represents the most advanced technology in MSW thermal treatment.

Gasification technology aims to address precisely the objections that Ms. Yamamoto has towards incineration, namely: the bottom ash and fly ash contain large amount of dioxins and heavy metals and cause secondary pollution. Furthermore, the ash accounts for "20% to 40% of MSW", which is at odds with the original intention to divert residual MSW from

landfills. IGAM burns the syngas converted from MSW at about 1,400°C so that dioxins decompose totally and the bottom ash is melted to vitreous slag (artificial sand) which meets the most stringent elution standards of soil and is recyclable. IGAM reduces MSW to safe ash in extremely small quantities compared to the feeding stock. Gasification is environment friendly.



Since being commercialized over 15 years ago, Ebara's gasification plants have operated without incident. On 23rd May 2005, the gasification technology was awarded the Excellent Environmental Facility by the Japan Society of Industrial Machinery Manufacturers. The largest order of the technology is the Malaysian gasification plant with a capacity 1,500 ton/d.

Japan shares some of the same problems as Hong Kong, namely a high population density, limited land and a MSW problem. Gasification is the most advanced method currently available for the thermal treatment of MSW.

Ebara is a long established company, gaining experience since 1920. Ebara is one of the principal manufacturers of fluid and gas transfer systems and a supplier of precision machinery to the semiconductor-device industry. We are also a prominent supplier of environmental engineering systems, especially facilities for the treatment of water and solid waste as well as waste utilization systems. At the same time, Ebara is actively developing new energy sources, including fuel cell systems, solar cells, wind power generation plants and other clean energy sources. Ebara Corporation is a member of the top 19 Japanese companies in the list of recommendable firms organized by Dow Jones for Sustainable and Responsible Investment (SRI) also known as Socially Reasonable Investment." [3] Ebara's business stretches worldwide. If an opportunity is afforded to us, we shall serve Hong Kong with the top quality under public supervision.

References

1. [Details of the accident]

   Ebara's Fujisawa Plant has a small-scale incinerator, 10 ton/d, for test and research. The accident was caused by a construction error in the connection of pipelines. As the result, the waste water from the wet scrubber for removing HCl, SO_x, Hg and dioxins from flue gas did not enter purification facilities but went to the rain drain pipe. The low-flow waste water, 5-10 m^3/hr, contained dioxins and heavy metal which exceeds the standards.

   The mistake had not aroused attention, since the exit of rain pipe was not monitored, until a routine test revealed that the water in a small river nearby had a dioxin level above the standards. An investigation immediately followed and found that the sea coast, local wells, crops, fishes in the area around the plant had dioxin concentration still lower than the national averages. It was determined that the impact from the accident was minor.

   This mistake in discharging waste water, however, does not imply any *gaseous emission* of incineration. The causes of the accident are deeply rooted in the complacency of staff because much larger incinerators (e.g. ~ 1,000 ton/d) have been built and successfully operated. The negligence in operating a very small incinerator was a serious failure in management.

   Investigation reports were submitted to the Authority and the aftermath of the accident was dealt with. "Ebara Corporation has implemented a new prevention plan to avoid recurrence of the emission." Ebara's measures finally made up the damage to environment and no legal responsibility was affixed.

2. Ebara's five basic principle of conduct:
   1. Realize any small conduct has a potential influence to serious outcome;
   2. Confirm in advance – purpose and meaning of action;
   3. Observe approved procedures and rules;
   4. Review the action taken, confirm the result, and be responsible for the result of action;
   5. Maintain wide open perspective, proceed with due elaboration even outside your scope of work.

3. http://www.sustainability-index.com/ "Corporate Sustainability is a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments. Corporate sustainability leaders achieve long-term shareholder value by gearing their strategies and management to harness the market's potential for sustainability products and services while at the same time successfully reducing and avoiding sustainability costs and risks."

Appendix: Our Attitude and Viewpoint

I. The **(23rd March 2000) incident** has motivated Ebara's company wide campaign for improvement so as to eliminate recurrence of emission, and release of information to the public. The company commemorates 23rd March as the 'Date of Basic Quality Behavior' to remind the mishap. Such corporate effort has earned substantial social evaluation. Ebara Corporation is a member of top 19 Japanese companies in the list of recommendable firms organized by Dow Jones for Sustainable and Responsible Investment (SRI) also known as Socially Reasonable Investment.

II. Objections towards the conventional incineration

a. Incineration generates dioxins.
b. Incineration ash contains dioxins and heavy metals, causing secondary pollution.
c. It is more important to reduce MSW and strengthen recycling.
d. Incineration is expensive.

[**Comments**] *A suitable refuse treatment technology has tremendous importance but we have deeply ingrained suspicion in mind against any refuse facility* (because of bad impression). Refuse is the negative side of modern life and any treatment risks secondary pollution. We wish a zero-emission community but still live in today's reality. It should be emphasized that no matter which technology is selected to treat residual MSW, it has to meet the most stringent standards of gaseous emission, water discharge and soil elution. Especially the concern about the emission of POP's, dioxins and furans should be released.

III. Standards

The EU Directive 2000/76/EC on 4th December 2000 stipulated *operating conditions*: the gas resulted from the process burns to 850°C (measured near the inner wall) for 2 sec. and to 1,100°C for 2 sec. for hazardous wastes; and set *air emission limit values*, e.g. toxic equivalence quantity of dioxins and furans is 0.1 ng/Nm^3 and 70% reduction of emission level compared to 1985.[5]

IV. Technology progress

The Chemicals Revolution' produces thousands of synthesis chemicals and one class of substances, persistent organic pollutants (POP's), threaten long-term health and ecological consequences that were never anticipated or intended. They cause 'cancer, immune-system disruption, nervous-system damage, liver damage, memory loss, endocrine disruption birth defects' etc. In May 2001 the Stockholm Convention on POP's set a first goal of restricting and ultimately eliminating production, use, release and storage of 12 most toxic POP's. Among them, polychlorinated dioxins and furans are two families of unintentional chemical by-products from incomplete combustion or industrial processes.

The EU directive shows that "high-temperature incineration" represents technical progress. *High temperature combustion decomposes dioxins*: dioxins form at ~ 300°C but decompose above 850°C, completely decompose above 1,000°C; ash will melt above 1,250°C.

Gasification & ash-melting system burns the syngas converted from MSW at about 1,400°C so that dioxins totally decompose and bottom ash melts to vitreous slag (artificial sand) which meets the most stringent elution standards of soil and is recycled.

V. Integrated waste management (IWT) system

The producer's responsibility will be legislated next year and the charge for collecting domestic rubbish in 2007.

An IWT proposal will be submitted to LegCo including MBT, anerobic digestion, and thermal treatment for diverting MSW from landfill.

Hence, there is no contradiction between IWT system and 3R of MSW. It is inspiring to notice the progress of Taipei in reducing MSW by 40% with the existence of incinerator plants.

VI. New and emerging technology

Gasification technology belongs to the '*New and Emerging*' solid waste management and recycling technology, [2] and is the latest and most advanced thermal treatment technology. It is the **friends of conservation**: the residual MSW will reduce by the most advanced technology to safe ash in extremely small percentage of feeding stocks so that the capacity of landfill is greatly saved and the urgency of expanding landfill sites is lowered.

VII. Public acceptance

It should depend on these *objective standards* to select the most suitable technology for Hong Kong, instead of personal inclinations. Emotional pro-and-con on the options is one matter but how to treat the daily residual MSW is another matter.

Whether the cost is competitive depends on: (a) the result of public consultation; and (b) tender.

References

1. www.europa.eu.int/comm./environment/wasteinc/newdir/2000_76en.pdf

2. (a) www.nyc.gov/sanitation, and www.nycedc.com "Request for Information – New and Emerging Solid Waste Management and Recycling Technologies and Approaches" (Release Date: April 21, 2004; Submission Date: May 24, 3.00 p.m) [The New York City Department of Sanitation (DSNY)]; "Evaluation of New and Emerging Solid Waste Management Technologies" (New York, USA, Sept. 16, 2004).
   (b) www.toronto.ca/tenders/proposal.htm "Request for Qualifications No. 9155-04-7021" (RFQL#9104-55-7021 Toronto, Canada, Jan. 21, 2004).
   (c) State of Qatar Ministry of Municipal Affairs & Agriculture "Invitation to Tender D4 DSWMC Incineration" (April 3, 2005)