Present Status and Trends of Environmental Preservation and Energy Conservation

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1. Introduction

At the "Third Conference of Parties of the United Nations Framework Convention on Climate Change (COP3)" held in Kyoto in December 1997, the "Kyoto Protocol" was adopted, specifying the targeted reduction in greenhouse gasses for advanced countries, beginning in the year of 2000.

At the conference held in Bonn in 1999, however, agreement could not be reached among the United States, the European Union and developing countries, on how and when to ratify the pollution control agreement adopted at COP3.

At present, emissions of greenhouse gasses such as carbon dioxide are increasing in most of the advanced countries, and therefore, the drive toward global environmental preservation is making very little progress.

In Japan, the "Law for Promoting Global Warning Prevention" was enacted in April 1999 in response to the numeric targets specified at COP3. This law obligates local governments and businesses to prepare, announce and enforce a plan of emission control. In May 2000, the "Basic Law for Promoting Formation of Recycling Society" was established and the year of 2000 was positioned as the first year of the recycling society.

Japan, the presiding country at COP3, is proceeding toward an environment-oriented economy with the aim of realizing a recycling society, in line with the "Rio Declaration" which specifies sustainable development as a fundamental principle.

In response to pollution control laws and regulations established during the 1960s and 1970s, Fuji Electric was the first company to engage in an end-of-pipe type, environment-related business, such as the manufacture and sale of water pollution prevention equipment. Environmental technology in the twenty-first century is expected to aim for the zero emission of pollutants, including a reduction in greenhouse gas emission. In order to contribute to global environmental preservation, Fuji Electric is promoting a variety of technology development and businesses in new environmental fields, such as proper waste treatment, waste recycling, pollution-free energy, energy conservation and environment-related information processing.

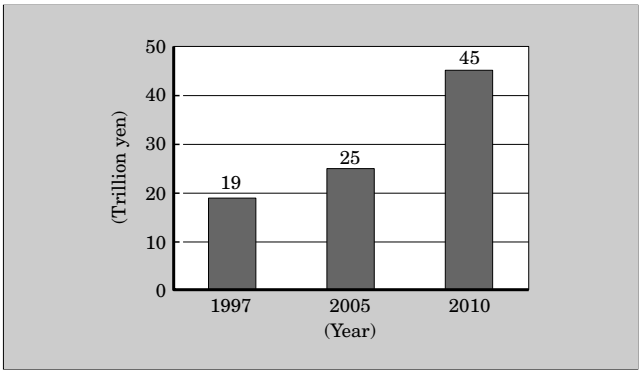
This paper introduces new trends of environmental preservation and energy conservation technology and Fuji Electric's efforts in that regard, and describes the future trends of conservation.

2. Environment-Related Budgets of Various Ministries

Global-environmental-preservation-related budgets for the fiscal year of 2000 amounted to 669.9 billion yen, a 4.1% increase over the previous year.

From a budgetary viewpoint, budgets for the "Campaign to realize a sustainable domestic society" and for "Investigation, research, observation and monitoring" increased 17% and 11%, respectively. The budget for measures against global warming is 553.1 billion yen, including budgets for support of local activities of promoting alternative energy and energy saving (Ministry of Economy and Industry), development and upgrade of a physical distribution system to reduce environmental impact, reduction in environmental pollution resulting from road maintenance and management work (Ministry of National Land and Transport), promotion of research and development of global climate change forecast (Ministry of Education, Science and Technology) and promotion of research on

Fig.1 Environmental business market size (The Ministry of Economy and Industry: Industrial environment vision)



the global environment (Ministry of the Environment). This trend of expanding global-environmental-preservation-related budgets is expected to continue in the future.

According to the "Study report on environment-related business" conducted by the Japan Machine Industry Association, it is expected that the size of the environment-related business market will reach 45 trillion yen in 2010. Figure 1 shows the size of the environmental business market.

3. Environment-Related Law and Regulations

In Japan, the "Basic Law for Environmental Pollution Control" was intended to address the pollution issues of the 1970s. As environmental issues became global issues, the "Basic Environment Law" was established in November 1993, specifying the basic philosophy and an overall framework for basic environmental policy. In December 1994, the "Environmental Basic Plan" was prepared, prescribing that most all waste be recycled to the extent possible instead of merely burning them, and that the heat generated during incineration be utilized.

The following laws related to environment and energy were prepared and enacted: the "Law for Partial Amendment of the Law of Rationalized Use of Energy" (Revised Energy Conservation Law), the "Law of Environmental Impact Assessment", the "Law for Promoting Separate Collection and Recycling of Containers and Packages" (Containers and Packages Recycling Law), and the "Law for Recycling Specific Consumer Electric Appliances" (Electric Appliance Recycling Law). Local governments are also vigorously preparing environment preservation measures in response to the above-mentioned laws. Based on Japan's envisioned concept of sustainable cities, several ministries announced their own plans and the intent to realize them in order to build environment-oriented cities and towns, such as "Ecocity" and "Ecoport" (Ministry of National Land and Transport), "Ecotown." (Ministry of Economy and Industry) and "Ecopolis" (Ministry of the Environment).

Development of new technologies and new businesses related to environmental preservation and energy conservation is strongly required for such new efforts as mentioned above.

4. Fuji Electric Group's Commitment to Environmental Business

In line with a new trend of environmental preservation that began in the 1990s, Fuji Electric Group formulated its "Environmental preservation basic plan" and strengthened its environmental preservation activities with the catchword "ECOLOGY*ing*." Fuji Electric Group applies useful environmental preservation technologies obtained during these activities to various fields, such as energy, water environment, atmospheric environment, zero emission, recycling and environmental information systems, and provides a wide range of comprehensive solutions for environmental preservation. Figure 2 lists Fuji Electric's technologies and products related to environmental preservation and energy conservation, and Fig. 3 depicts their application.

4.1 End-of-pipe

The technology to treat hazardous substances at drain openings is known as "end-of-pipe." End-of-pipe technology has developed in Japan as a measure against environmental pollution since the 1960s. Fuji

Fig.2 Fuji Electric's technologies and products related to environmental preservation and energy conservation

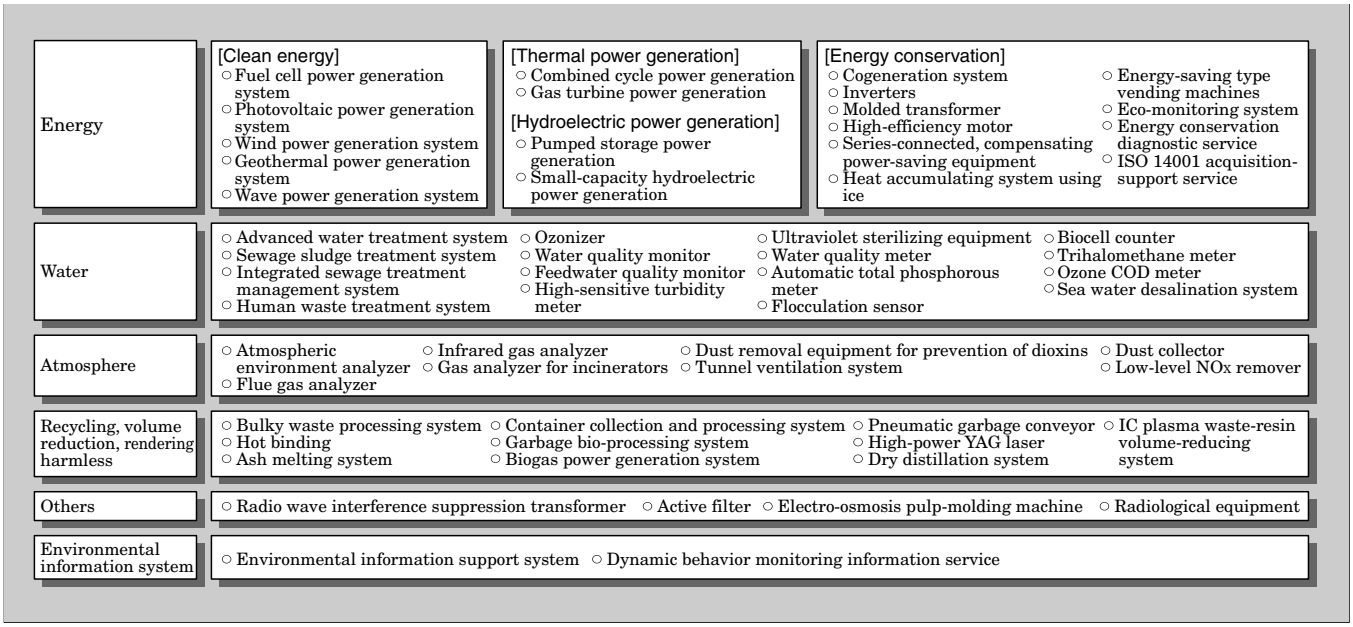
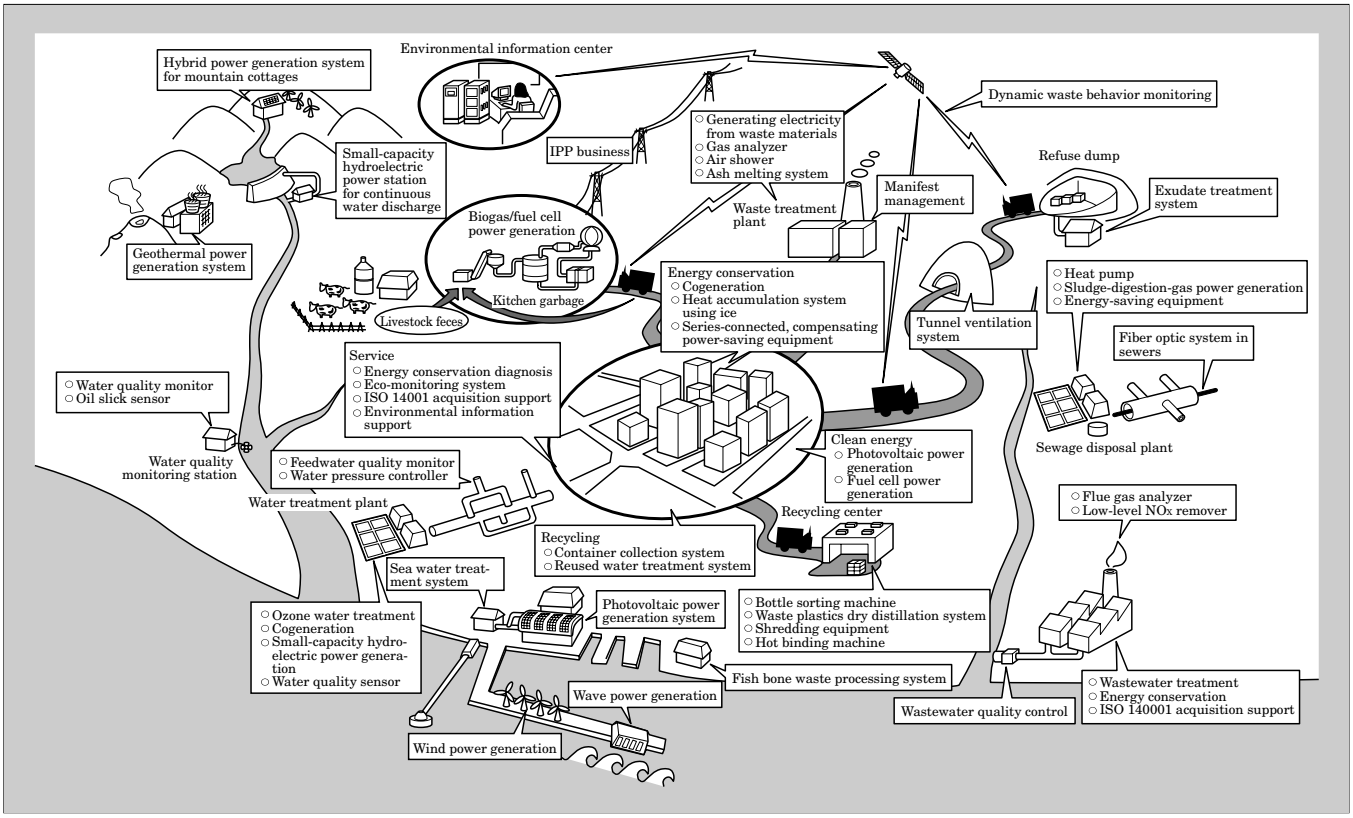


Fig.3 Fuji Electric's measures for environmental preservation and energy conservation



Electric Group has utilized its excellent proprietary water treatment technology, water and air analysis technology and electrostatic precipitation technology, to provide end-of-pipe systems that include advanced water treatment systems, sewage sludge treatment systems, tunnel ventilation systems, atmospheric environment analysis equipment, final waste disposal plants, etc.

In recent years, with strengthened anti-pollution laws and regulations, such as the "Waste Disposal and Clean-up Law," "Revised Air Pollution Control Law" and "Environmental Impact Assessment Law," advanced techniques related to environmental measurement and purification treatment are increasingly required.

To meet these demands, Fuji Electric has developed and commercialized water quality sensors that utilize bioassay technology, compact environment-resistant sensors, and eco-monitoring systems that utilize radio transmission. Fuji Electric has also developed a system to compile a database for environmental information management using aggregated data.

4.2 Waste recycling

Waste recycling, sometimes described as a "vein-like industry", is the most important element in structuring a zero emission industry. Recycling requires technologies for reduction in volume, sorting, disassembly, reuse, recycling and effective use of energy.

Fuji Electric Group has, in the past, provided technologies and products for reduction in volume, sorting and disassembly, such as shredding equipment for bulky waste and induction heating equipment for waste plastics. Based on these experiences, and placing new emphasis on material recycling and thermal recycling, Fuji Electric Group is vigorously working to promote reuse and recycling by developing can, glass bottle and PET (polyethylene terephthalate) bottle recycling systems, ash melting systems and waste plastic dry distillation systems, and by developing energy utilizing RDF (refuse derived fuel) power plants, garbage-fermented methane gas power plants and other systems.

4.3 Clean energy and energy conservation

The introduction of clean energy and promotion of energy conservation is gaining attention as a means to reduce greenhouse gasses to prevent global warming.

Fuji Electric Group was one of the first companies to develop solar battery and fuel cell technology, and has provided a variety of power generation systems including wind, geothermal, wave and hybrid power generation systems for a variety of customers such as IPPs (independent power producers) and remote mountain cottages. For energy conservation, Fuji Electric provides energy conservation systems, such as inverters, power-saving equipment, high-efficiency motors, and energy conservation systems, such as cogeneration and heat accumulating systems using ice. Based on

the results from its own energy-conservation activities, Fuji Electric Group provides energy-conservation diagnostic service and ISO 14001 acquisition-support service.

4.4 Environmental information support system

With enactment of the Revised Energy Conservation Law and Environmental Impact Assessment Law, measures to preserve environment and conserve energy have become imminent. First of all, it is important to collect and utilize environmental information. Fuji Electric Group provides an environmental information support system comprised of environmental sensors and an information processing system. The support system features integrated support for a variety of application services utilizing flexible environmental sensors with wireless communication and advanced IT (information technology). The support system allows preparation of environmental reports, implementation of environmental accounting and connection to networks, such as the Internet, facilitating the disclosure of environmental information.

5. Fuji Electric's Efforts to Preserve Environment

In 1992, Fuji Electric formulated "Fuji Electric's environmental preservation basic policy" shown in Fig. 4 and is determined to do business in all fields by establishing specific targets for environmental preservation based on symbiotic relationships with the global environment.

5.1 Acquisition of ISO 14001 certification

In 1998, all of the Fuji Electric factories completed acquisition of the international standard ISO 14001 certification for environmental-management systems with the aim of understanding and reducing the environmental impact resulting from business activities. As a citizen of the global environment, Fuji Electric is continuously and systematically improving its environmental management as well as performing activities to reduce environmental impact.

5.2 Action programs

(1) Recovery of chlorofluorocarbons (CFCs) to protect the ozone layer

The use of CFCs and 1,1,1-trichloroethane, which had been used for many years as refrigerant in vending machines and open refrigerated cabinets, is completely banned. For CFCs still used in products on the market, Fuji Electric is considering recovering them in cooperation with local governments and parties concerned.

(2) Promotion of energy conservation for global warming prevention

With enactment of the Revised Law Concerning the Rational Use of Energy, the company established an energy conservation target to reduce energy per basic unit output by at least 1% per year. To be specific, the company has worked diligently to increase efficiency and decrease energy consumption of various facilities including air-conditioning systems, substations and heat treatment furnaces, and to introduce alternative energy and energy assessment at the time of investment in plants and equipment.

(3) Reduction in volume of industrial waste

While making every effort to reduce the volume of industrial waste, such as wastepaper, wood chips, waste plastics, sludge, waste oil, waste acid and waste alkali, the company thoroughly performs sorted collection of wastes and has organized disposal procedures for reuse and recycling after the sorted collection. The company also designs easy-to-disassembly products and uses recyclable materials, leading to an improved recycling rate of products.

(4) Product assessment of main products

During the development stage of a product, the company implements a rigorous product assessment of

Fig.4 Fuji Electric's environmental preservation basic policy

In promoting global environmental preservation and environmental pollution protection, Fuji Electric Group is determined to follow the following basic policy, understanding its responsibility to the global society as a citizen.
The whole Group is determined to do its very best, through its sound business activities, to strengthen the bond of trust with local communities, customers and business partners and to achieve harmony with the environment.

1. Reduction in environmental impact throughout products' life cycle
In providing its products to the market, Fuji Electric Group shall reduce the environmental impact as much as possible throughout products' life cycle from development, design, manufacturing, packaging, distribution, use to disposal.

2. Technology and products useful for global environmental preservation
Fuji Electric Group shall positively contribute to environmental preservation through providing the market with products in its areas of expertise, such as energy-saving equipment, alternative energy equipment, environmental measuring instruments and pollution prevention equipment, and their technologies.

3. Promotion of global warming prevention
To promote global warming prevention, Fuji Electric Group shall further reduce energy consumption and carbon-dioxide emission in-house, through encouraging energy-saving activities.

4. Promotion of resource saving and recycling
To effectively utilize the limited resources on the earth, Fuji Electric Group shall reduce the amount of materials used in its products and in manufacturing and packaging, and also reduce and recycle waste materials to the extent possible.

5. Improvement in working environment
To enhance employee health and safety, a precondition for active workplaces, Fuji Electric Group shall improve the working environment and facility safety, enhance workplace amenities and introduce advanced technologies at an early stage.

6. Environmental assessment during site selection of a new factory
When selecting a site for a new factory, Fuji Electric Group shall conduct an appropriate environmental assessment in advance, in consideration of environmental preservation.

7. Compliance with regulations and standards related to environmental pollution
Fuji Electric Group shall strengthen its management to obligate its employees to more strictly comply with regulations and standards for environmental preservation.

8. In-house audit
Fuji Electric Group shall perform an in-house audit of its environmental preservation activities to verify whether they are satisfactorily conducted.

certain items to determine the extent of a product's environmental impact throughout its life cycle from design, manufacturing, and use to disposal.

5.3 Fuji Electric Group's environmental logo

Fuji Electric Group adopted the environmental logo shown in Fig. 5, to express its commitment to environmental preservation.

6. Conclusion

This paper described Fuji Electric's environmental-preservation and energy-conservation technology development and its commercialization of that technology.

This paper does not cover the whole range of the company's activities related to environmental preservation and energy conservation. For further details refer to separate papers in this special issue.

The papers listed below describe Fuji Electric solutions to environmental preservation and energy conservation that are not covered by this paper.

Fig.5 Fuji Electric Group's environmental logo

(1) Fuji Electric Review: Water management technologies, Vol. 45, No. 4 (1999)
(2) Fuji Electric Review: General-purpose inverters and servo systems, Vol. 46, No. 2 (2000)
(3) Fuji Electric Review: Fuel cell generation, Vol. 4 7, No. 1 (2001)

Reference

(1) JAPAN TECHNICAL INFORMATION CENTER: American Environmental News, Vol. 8, No. 12 (2000)