



R&D to Promote Environmental Protection



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1. Contributing to a Sustainable Society through IT

<http://www.ntt.co.jp/kankyo/e/2000report/4/411.html>

1. Contributing to a Sustainable Society through IT

The rapid development of information technology (IT) has fostered radical changes in business models and business styles, making a significant contribution to reduced environmental impact in a variety of fields. Specializing in IT, the NTT Group aims to maximize the potential of information technology for the benefit of society and the environment.

Ecology Networks

■ Significance of environmental information sharing systems

Environmental issues are global concerns that go beyond the mere collection of information or isolated local efforts. Environmental information sharing systems can be an effective way to promote environmental activities on a global scale. Ideally, such systems can be constructed to enable the following:

- Understanding not only of the present but of past environmental conditions;
- Communication of a variety of relevant information covering social economies, history and culture, as well as the natural environment, to generations to come;
- Cooperation and exchange beyond the boundaries of local communities, promoting enhancement of environmental awareness and unity;
- Broad-based support for environmental initiatives, ranging from individual households and local communities to international efforts.

■ Ecology networks defined

An ecology network is a typical example of a lifestyle environmental information sharing system. Environmental information reported by private individuals as well as information gathered by various sensors is accumulated into databases at regional environmental information centers. This information is made available to the public, providing support for a wide range of environmental activities.

Specifically, ecology networks are expected to play a role in disclosure of environmentally important because nitrogen dioxide is:

ronmental information by local governments, in general environmental education, and in environmental research at universities and other institutions.

Today, a great deal of effort is required for quantitative definition, comprehensive evaluation, and appropriate disclosure of the potential relationship between environmental, lifestyle and business information when dealing with environmental protection issues. Research to develop solutions to these and other environmental concerns is being conducted through ecology networks.

■ IWATE-UNU-NTT Environmental Network Joint Project

Launched in September 1998, the IWATE-UNU-NTT Environmental Network Joint Project is a collaboration between Iwate Prefecture, the United Nations University (UNU), and NTT Group. The project is involved in monitoring air and water quality and studying potential applications of the resulting information in environmental education programs. The environmental education programs are conducted jointly with Ecology Community Plazas established by the Iwate Branch of NTT East.

IWATE-UNU-NTT Environmental Network Joint Project

<http://www.ias.unu.edu/ecology/>

Ecology Community Plazas at Iwate Branch

<http://eco.iwate.isp.ntt-east.co.jp/>

Nitrogen Dioxide Monitoring System

- Inadequately controlled by existing environmental standards;
- Exhibits fluctuations in density depending on time and place, thus requiring multiple, simultaneous measurements;
- Often generated by unpredictable occurrences such as traffic congestion.

The NTT system features compact terminals for ease of transportation and installation, while enabling remote operation and simultaneous measurement at multiple locations via telephone networks. The easy-to-operate terminals can also be used as Internet tools for environmental education.

Results of measurements taken at Sendai City Museum of Science and other educational facilities in Miyagi Prefecture:

<http://sendai-no2.mcon.ne.jp>

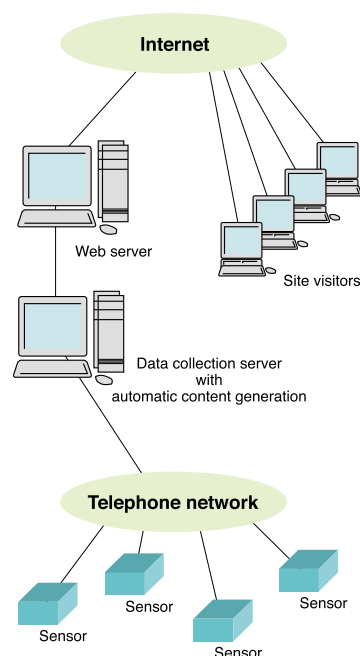


Fig. 4.1-1 Sample system configuration

Multimedia Communications Services for Teleconferencing

■ Advantages of multimedia communications services

The NTT Group provides a variety of multimedia communications services through its nationwide networks. Multimedia communications enable people to exchange information from remote locations, minimizing the need to transport people and equipment and thus reducing energy consumption and exhaust emissions.

■ Desktop simulation of teleconferencing

The Lifestyle and Environmental Technology Laboratories has conducted desktop simulations to determine the effectiveness of teleconferencing (Fig. 4.1-2) in minimizing environmental impact. At a teleconference, participants in remote locations can interact as if they were present in the same meeting room by exchanging images and voices over a network. As teleconferencing is targeted as an important multimedia communication service, the simulations were structured as follows:

- A total of 1,657 teleconferences were held at NTT (the holding company) during a single year (limited to conferences recorded in the multi-location connector);
- Environmental impact was calculated based on power consumption of system equipment (monitors, cameras, speakers, etc.) and telephone networks used for each teleconference (assumed to last for two hours);
- Hypothetical environmental impact of various means of transportation (trains, buses, planes) was estimated, assuming that conferences had been held on-site with actual attendees (each conference assumed to require two attendees from each remote office and last for two hours);
- Environmental impact of on-site conferences vs. teleconferences were compared and evaluated.

As a result, it was evaluated that teleconferencing reduces CO₂ emissions by approximately 85% and energy consumption by approximately 74% compared to on-site conferences. (Fig. 4.1-3)

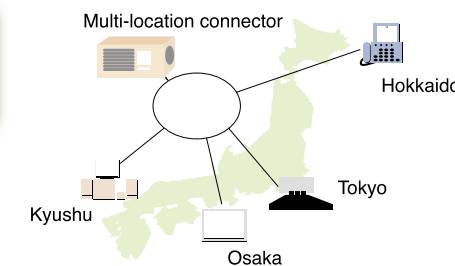


Fig. 4.1-2 Teleconference system

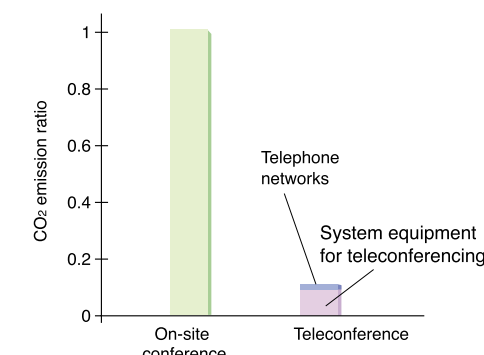


Fig. 4.1-3 Reduction of environmental impact by teleconferencing

The initial simulation evaluated operational aspects only. Further study based on LCA (Life Cycle Assessment) is planned to evaluate the environmental impact of teleconferencing equipment from initial production to final disposal.

Electronic Commerce

In 1999, the number of Internet users in Japan increased from 17 million to 27 million at large, successfully demonstrating the security of electronic cash.

a surge in Internet-based trading (electronic commerce). The value of B2C (business-to-consumer) transactions grew from ¥170 billion to ¥350 billion, while B2B (business-to-business) transactions grew from ¥2 trillion to ¥14 trillion.

■ Network-based information distribution

Traditionally, trucks and other forms of transport have played the major role in the physical distribution of goods. With the introduction of electronic commerce, intangi-

ble information-based products such as music and games have become available through network-based distribution. This eliminates the need to maintain stocks or to rely on media (CD-ROMs, etc.) for distribution of goods. Offering significant reductions in energy consumption, network-based information distribution shows great potential for environmental protection. Digitally recorded music, for example, can be distributed through networks quickly and with much less impact on the environment. On the other hand, as digital data can be copied easily, with no deterioration in quality, certain types of network-based distribution could conceivably interfere with the fair sale and distribution of goods.

■ Overcoming technical difficulties

Electronic commerce requires effective measures against unauthorized data copying. The NTT Group has solved this problem by developing a technology that locks the memory card to which purchased music is originally downloaded and makes it impossible to read any other memory card to which the music is copied. This technology paves the way for widespread network-based music sales.

Payment systems pose another security problem for electronic commerce. Secure and efficient systems for exchanging money and goods are essential for promoting conversion of physical distribution into network-based information distribution.

The NTT Group has developed technologies for electronic cash secured by codes. Reliability and convenience of this technology were tested in actual experiments in

cooperation with participants from the public

at large, successfully demonstrating the security of electronic cash. The NTT Group will expand its focus to include development of technologies for authentication and network security as we continue our research into applications for electronic commerce.



2. R&D to Promote Reduction of Environmental Impact

Recycling of Plastic Using Supercritical Water

The volume of waste recycled by the NTT Group is increasing year by year. Plastic wastes, however, are difficult to recycle due to their massive volume and the wide variety of materials used in their manufacture. To deal with this dilemma, the NTT Lifestyle and Environmental Technology Laboratories are currently developing a new recycling technology to decompose plastics using water. (Fig. 4.2-2)

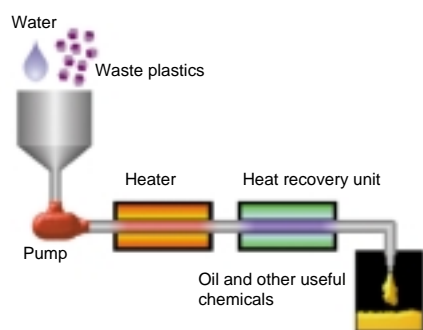


Fig.4.2-2 Conceptual diagram of plastic recycling technology

The plastic recycling technology is based on the properties of supercritical water. Water, when heated to temperatures in excess of 374°C and pressurized to over 218 atm, reaches a supercritical state with properties that can effectively liquefy oil-based plastics. The plastic recycling process in the above diagram can be explained as follows:

- (1) Water and crushed and fragmented plastic are mixed as shown in Fig. 4.2-2.
- (2) The mixture is compressed by a high-pressure pump and sent into the tube.
- (3) The mixture is heated at the halfway point of the tube until the water reaches the supercritical state. Part of the energy generated by the heat is recovered for later cooling of the mixture.
- (4) Oily residues, the raw materials of plastic, are collected at the end of the process as illustrated in Fig. 4.2-2.

A prototype of the system was tested using various kinds of plastics from optical fiber

cables, with the system successfully recovering recyclable organic substances.

By liquefying plastics with water instead of organic solvents, minimizing the generation of volatile toxic substances, requiring shorter reaction time and enabling heat recovery, this system shows significant potential as a recycling technology of the future.

Fuel Modification Equipment

Since 1999, NTT Auto Leasing has been engaged in development of fuel modification equipment to reduce black smoke and carbon dioxide emissions from diesel-powered vehicles.

Fuel modification equipment drastically reduces the black smoke, NO_x, and other air pollutants generated by fuel combustion, simultaneously reducing the overall volume of CO₂ emissions by improving fuel efficiency.

Efficiency is being field-tested from April 2000, with installation of the devices on large-sized vehicles with diesel engines (trucks: 2 units, buses: 5 units).

Multifunctional Rapid Disposal Vehicle for Sewage and Sludge

Since 2000, NTT Auto Leasing has been engaged in development of a multifunctional rapid disposal vehicle to provide a leasable system incorporating combined technology for use against the worldwide spread of river and ocean pollution caused by sewage and sludge.

Today, most of the run-off from construction sites and dye works is not properly disposed of, but simply diluted with huge volumes of water and discharged into rivers and oceans, accelerating the pace of river and ocean contamination. This can be attributed to the huge costs that are involved in the construction of treatment facilities.

NTT Auto Leasing seeks to develop a solution by providing businesses lacking their own treatment facilities with mobile

effluent treatment systems mounted on vehicles.

The multifunctional rapid disposal vehicle is equipped to recycle effluent and sludge from construction sites or stock farms through rapid simultaneous solid/liquid separation and deodorization. With its ability to travel to various sites, this mobile treatment system will promote cost reduction and make a significant contribution to environmental protection.