"Total Eco-Solution for Office" - a State-of-the-art Office Model that Achieves a Halving of CO$_2$ Emissions and Implements Innovative Work Styles

The NEC Tamagawa Solutions Center started its operations as an eco-friendly building in May, 2010. It also introduced ICT (Information Communications Technology) equipment and solutions as a state-of-the-art office model in order to become a "Total Eco-Solution for Office". By implementing innovative work styles it expects to halve CO$_2$ emissions and to reduce the operational cost by 300 to 400 million yen per annum. In the case study discussed below, while improving office job efficiencies and staff motivation in the work place, the model also impresses by how smoothly it is able to transform an office facility into an up-to-the-minute working environment as well as by how much it can motivate staff commitment. We are planning to launch the results obtained from this case study in order to challenge the requests of our customers.

"Total Eco-Solution for Office"- A State-of-the-art office model

NEC is aiming to create an "information society friendly to humans and the earth". In order to achieve these aims, we have created office buildings influenced by environmental awareness and have been tooling up to provide an innovative work style by employing state of the art ICT equipment and solutions. Through these activities, we have been able to accumulate a significant amount of related expertise. The world expects the imposition of tighter regulations for the enforcement of environmental protection. In such a scenario the Tamagawa Solutions Center that became operational during May, 2010 has been built as a state-of-the-art office model that we refer to as a "Total Eco-Solution for Office". The center was created as an ecologically friendly building and in order to offer further enhancement we introduced energy-saving ICT equipment and solutions to the building.

NEC Tamagawa Solutions Center is expected to reduce CO$_2$ emissions by 50% and to achieve a significant operational cost reduction compared to that of a conventional office building by optimally adopting enhanced building facilities and ICT equipment and solutions. Moreover, quantitative and qualitative efficiency verifications are being carried out in order to demonstrate business operations efficiencies, work style innovation by influencing staff attitudes and a smooth transfer of the operational environment from that of a conventional office environment to one of a "Total Eco-Solution for Office" environment. In addition, we are planning to provide the resulting features confirmed from our office model performance to support customers as a total solution that can meet all of their issues.

Photo 1   A stop in the "eco-Tama" office visiting course.

The NEC Tamagawa Solutions Center is located inside our Tamagawa Plant in Kawasaki city; a 12 storey building with a 2-storey penthouse at the top, a building area of approximately 4,400 m^2 and a floor area of approximately 48,500 m^2. Around 3,000 staff working mainly in various software development departments are accommodated in the building.

An office visiting program called "eco-Tama" is arranged for customers so that they can experience the "Total Eco-Solution for Office" and thereby heighten their eco-awareness. Many of our customers have already joined this program and have thus had experience of a state-of-the-art eco-office of the next generation (**Photo 1**).

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Rigorous Energy Saving Measures Applied to the Building and Its Infrastructural Facilities

Rigorous energy saving measures affecting facilities that range from entire buildings to lighting and air conditioning services are being applied at the Tamagawa Solutions Center. The building itself and the infrastructural facilities were designed with the aim of achieving environmental energy saving. Even at the construction planning stage, they were designed by considering their entire life cycles from the perspective of the 100 year life expectancy of the building.

The following detailed solutions are introduced to support facilities and products.

- **Building management system (Butics)**
Integrated centralized monitoring for 24 hours throughout 365 days is available by integrating all subsystems for the control of the air conditioning, lighting, electricity, and fire prevention facilities, etc.
- **"Visualization" of the energy usage amount**
In order to improve awareness of energy saving issues, display screens are located so that staff may readily visualize the amount of electricity consumption and CO$_2$ emissions of the entire building and also for each floor (**Photo 2**).
- **Office lighting**
Panel type grid system ceilings are employed in order to enable easy maintenance and modifications and to cope with floor layout changes. Moreover, high-efficiency light reflectors are adopted so that a single light achieves the brightness equivalent to that of two of the fluorescent lighting tubes.

Photo 2   Visualization of energy usage quantities.

Photo 3   Natural ventilation system, automatic electric shutter blinds and Low-e window glass.

- **Natural light**
Spaces for the elevator halls and corridors are designed to be filled with natural light so that the electricity used for lighting can be reduced.
- **Lighting of communal areas**
LED lighting and Cold Cathode Fluorescent Luminaire are installed in communal areas because of their characteristically low electricity consumption and long service lives.
- **Air conditioning**
To save electricity used by the air conditioning, the following three measures are employed: 1) natural ventilation systems that open a vent automatically according to the outside weather condition, 2) automatic electrical shutter blinds to shade direct sun light by detecting the solar position and 3) Low-e window glass to achieve sufficient heat shielding and heat insulation efficiencies (**Photo 3**).
- **Sun light shielding pre-cast concrete (PC) ribs**
Direct sun light intrusion is softened by installing vertical PC ribs at the east and west sides of the building.
- **Tree foliage**
As a visible and environmentally-friendly feature, foliage in the form of scenic greenery is provided by planting trees in some area of the rooftop and also close to the wind protection wall located at the north side of the building.
- **Low pollution type weather resistant paint**
A low pollution type weather resistant paint is used on the exterior in order to extend the maintenance cycle.
- **Using rainwater and grey water**
Rainwater, cooling tower water and kitchen wastewater are treated and recycled to be used as toilet rinse water, thereby contributing to efficient water resource usage.

● **Water thermal storage system**

Thermal storage tanks are installed that use night time tariff electricity in order to heat and store water. The stored warm water is used during the daytime peak electricity consumption period in order to regulate the electric power load balance between night time and day time.

● **Waste disposal facilities**

General waste is compressed in order to reduce the number of waste collections and the waste generated by the staff cafeteria is composted.

Energy-saving Measures with Optimum Use of ICT Equipment and Solutions

With regard to the environmentally friendly measures adopted by using ICT products and solutions employed in the building are classified under the three headings of; paperless, teleconferencing and mobility and security.

How the ICT equipment and solutions is used under each subject heading is described below.

(1) Paperless

● **Large-size display**

Large-size displays are set up in the conference rooms and meeting corners. This makes it possible to hold conferences and meetings without preparing paper documentation. This strategy also reduces the time required to print out paper documents for the meetings; a process that used to consume staff working hours (**Photo 4**).

● **Secondary displays**

The paper documentation that used to be required for work

Photo 4   Large-size displays located in conference rooms and meeting corners.

Photo 5   Multifunction printer shared by multiple staff.

will be rendered unnecessary by providing a secondary display for all staff. The secondary display will be used instead of paper documentation, so that work efficiency will thereby be greatly improved.

● **File servers**

The files to be used for the business operation will be stored and integrated in the servers at the data center. These servers may be used just as the office cabinets that were previously used to store paper documents.

● **Multifunction printer**

In order to reduce the amount of printing of paper documents, the new concept of the office environment is that of sharing one machine among multiple staff. One multifunction printer is shared by about 50 staff and individual authentication is required to use the machine (**Photo 5**). By scanning paper documents and converting them into electronic data, which is one of the functions of the multifunction printer, the space and time used for filing paper documentation can be reduced.

(2) Teleconferencing

● **Web conferencing**

Web conferencing systems with Web cameras and headsets are located at staff desks so that they can attend remote conferencing sessions at any time without leaving their desks. Up to 20 people can attend a web conference and up to eight people at one time can be displayed on a screen. This facility makes it possible to improve communications and leads to quicker and more effective decision making.

● **Video conferencing**

Video conferencing systems are installed in most of the

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Photo 6 High-quality videoconferencing system (VC3000).

conference rooms in order to hold remote conferences with our staff from both inside and outside of Japan. The system helps to reduce the number of business trips and the amount of CO_2 emissions that result from the use of transportation systems.

● **High-quality videoconferencing system (VC3000)**

High resolution images and high quality voice sound compared to those of conventional video conferencing is achieved. The system is composed of three screens and two of them display images of other conference room and convey subtle face expressions, atmosphere and even moods and tensions. A video conference enabling satisfactory conditions may therefore be expected (**Photo 6**).

(3) Mobility and Security

● **Eco-friendly Notebook PC**

Various power saving functions are installed in the notebook PC to reduce electrical energy consumption. These include a function that automatically controls the brightness of the LCD screen, an ECO button to switch the PC to the ECO mode depending on the usage scenario, and various other functions.

● **Thin client**

Thin client servers are employed in order to maintain the user PC desktop environment and the data in a server and also to minimize the functions to be installed in the terminal. The thin client server system also realizes PC desktop environment mobility. Users can access their PCs from various places while maintaining their PC desktop environment. At the same time the information leakage risk is avoided and higher security is achieved. Moreover, the maintenance cost is also reduced by centralizing and con-

trolling the network PCs.

● **Dual Terminal**

Each of the staff in the center uses a dual terminal. Dual terminals can be used in the office instead of extension lines and as mobile phones outside the office. Telephone numbers are allocated to each staff dual terminal so that a telephone call comes directly to a specific dual terminal. This procedure reduces the work load of the telephone operators, and it is also an appropriate procedure for the person making the call.

● **Wireless LAN**

Wireless LAN provides an environment that allows staff to connect to the network from wherever they are in the office. The system will improve their operational efficiency and also give more flexibility for arranging office layout changes.

● **EnePal PC**

By "visualizing" the electrical energy consumption of PCs, the energy-saving awareness of staff will be heightened. Software is employed to reduce CO_2 emission. User behavior patterns are recorded and electricity consumption wastage is automatically reduced.

NEC has accumulated a significant amount of knowhow regarding the best use of ICT equipment and solutions, mainly in the "NEC Innovation World" building (the former NEC Broadband Solutions Center). We intend to optimally apply this ongoing acquisition of expertise to improve work styles and upgrade the efficiency of projected business operations.

The Key is Innovation of Staff Motivation

The NEC Tamagawa Solutions Center has been created with an awareness of ecological issues and has also been introducing ICT equipment and solutions with the aim of creating the state-of-the-art office model of the "Total Eco-Solution for Office". Advantages acquired from the building are displayed in the **Fig** .

Whether or not quantitative or qualitative efficiencies can be achieved depends on the attitudes of individual staff regarding how much they are aware of energy saving issues. This is the key to achieving the desired efficiency results, more in fact than had been anticipated. We are attempting to influence the minds of our staff positively so that each one of them is enabled to apply relevant solutions in making a greater effort to save energy.

An example of our eco-friendly promotion at the NEC

■ CO_2 reduction: CO_2 emission reduction of 3,132 tons/year (by 50% compared to that of the conventional office)
  ● 2,002 ton/year: To be achieved by environmentally conscious planning such as by the construction of
    buildings designed to cope with energy saving measures.
    1,130 tons/year: To be achieved by work style innovations optimally using ICT equipment and solutions.
■ Cost reduction: Cost reduction of 300 to 400 million yen/year
  ● Printing costs: 50 million yen approx.
    · Paperless promotion reduces the cost of paper documents for everyday work, conferencing and filing, etc.
  ● Business trips: 250 million yen approx.
    · Teleconferencing systems reduce the transportation costs for business trips.
  ● Various office construction costs: 30 million yen approx.
    · Staff can move around the office more smoothly so that the cost of desk layout changes due to personnel
      reorganization and network installations can be reduced.
  ● Electricity fees: 30 million yen approx.
    · Employing energy saving ICT equipment reduces the electricity costs.
■ Improving business operations efficiency
  ● Improvements in efficiency of various business operations
    · The hours required to be taken up in various business operations can be shortened.
  ● Boosting staff motivation
    · The state-of-the-art office heightens the working motivation of the staff.

Fig.   Expected efficiencies at the NEC Tamagawa Solutions Center.

Tamagawa Solutions Center is to heighten staff awareness of the need for paperless work by implementing the fruits of our experience as obtained at our head office and the NEC Innovation World. Here, we placed waste bins at locations in the offices where all staff could see them and they were asked to place any discarded paper documents in them. All staff may then see the volume of waste paper accumulating in the waste bin. This strategy will help accelerate the judgment speed when someone has to decide whether he/she discards paper documents after converting them into electronic data or before converting them into electronic data. As a result of such actions, a significant amount of paper and also more cabinet storage space can be released for other purposes and in consequence an office that has no need to depend on paper documentation may ultimately be achieved. Reducing the number of multifunction printers can contribute to influencing staff decisions about whether or not to print out paper documents.

What sort of idea or process is employed is very important when trying to influence the innovating of staff attitudes.

However, it seems that the staff are appreciating our efforts. They say: "teleconferencing reduces after-hours work", "using displays instead of paper documents enables smoother conferencing", "an open working atmosphere and pleasant office environment improves work efficiency", "refreshment spaces located with consideration of staff movements in the office provide relaxation opportunities and also offers a chance to have chats with the staff of other departments", etc.

NEC will continue to gain proficiency in influencing the minds of staff and will provide the results to our customers. We intend to contribute to a decrease in environmental loads by promoting the innovation of office facilities, ICT equipment and solutions, and staff attitudes. Our "Total Eco-Solution for Office" will improve business operation efficiencies and reduce office management costs. We will continue to do our best to present overall solutions in establishing eco-friendly offices in order to satisfy the needs of our customers.

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