Green Product Development

We are working to develop products with superior eco-friendly characteristics throughout their life cycle, from design to collection.

We are employing internally developed "Green Product Evaluation Standard" criteria that are applicable throughout the Fujitsu Group to: develop products that help to save energy; reduce, reuse and recycle resources; and reduce chemical emissions throughout the product life cycle — rather than only in the design and manufacturing stages. We accompany this development of products featuring superior eco-friendly characteristics with efforts to promote recycling as well. Each Green Product contributes in its own way to lowering the environmental burden.

Product Life Cycle

Development/Design stage → Manufacturing stage → Customer use stage → Collection/Recycling stage

Development/ Design

We have designed and developed Green Products since 1998, based on internal criteria specified in the internal "Green Product Evaluation Standard." The process is now integrated to include activities from the selection of eco-friendly parts to conducting of product LCAs.

Green Product Development

Process for Developing Green Products:

Process for Developing Green Products:

Step 1: Product environmental assessment (43 criteria)

↓ Total number of points evaluated: over 90

Step 2: Evaluation based on Green Product Evaluation Standards: common standards and product category-specific standards

↓ Product meets all relevant criteria.

Green Product — Environmental Emblem

Criteria

Common standards (27 items)	+	Category-specific standards	
		Electronic parts (semiconductors, PCBs):	5 items
		Portable/small products (mobile phones, HDDs):	6 items
		Midsize/large products (servers, finance-related terminals):	6 items
		Personal computers:	14 items
		Printers (all sizes):	8 items

Revisions of Standards:

We have upgraded our standards in recent years to take into account various regulatory measures to encourage a cyclical society and the establishment of eco-labeling systems.

[Main Points]

1. Extension of CO_2 emission assessment criterion to all Green Products (common standard)
   - Obligatory assessment by LCA of full life-cycle CO_2 emissions for all products with possible global warming effect
2. Addition of new criteria related to eco-friendly stipulations in the Law on Promoting Green Purchasing*1 concerning recycled plastics and use of reusable parts (category-specific standard)
   - Obligatory use of recycled plastics or reusable parts in all newly developed products, effective April 2002
   - Application to electronic calculation devices (including PCs), magnetic disks, printers and scanners
3. Extension of standards to cover products regulated due to presence of mercury-containing LCD fluorescent tubes (category-specific standard)
   - Previously applied only to Fujitsu-developed LCD units, the standards have been extended to procured products in consideration of trends in EU chemical regulation.

Consolidated subsidiaries must comply with all Fujitsu Green Product evaluation standards. Please refer to the appendix for details concerning the Green Product evaluation standards.

Green Product Development Results

The Fujitsu Environmental Protection Program (Stage III) extends Green Product development to the entire Fujitsu Group. In fiscal 2001, the list of Green Products was expanded to include electronic devices and telecommunications equipment. The number of products developed as Green Products totaled 265.

Fujitsu (234 models)

Information equipment

- Notebook computers
- Desktop PCs
- LCD/CRT displays
- Disk arrays
- Opto-magnetic disks
- UNIX servers
- Data communications terminals
- Totalizator system
- Printers
- No-break power generator unit
- ATMs/finance-related terminals
- Printed circuit boards
- Small magnetic disks
- Scanners
- Pen notebook computers
- Semiconductor disk equipment
- LCD units
- Storage management processors

Telecommunications equipment

- Routers
- Mobile phones
- Photonic IP nodes
- WDM undersea signaling equipment
- VoIP gateways
- MPMs (mobile packet modules)
- Security
- Image transmission equipment (Video co-decks)
- FOMA mobile phone handsets
- Optical transmission systems
- IP image monitoring/distribution systems

Electronic device products

- Flash memory

Consolidated subsidiaries (31 models)

PFU

- Scanners
- Card processors
- Information service stations
- Panel computers

Fujitsu Ten

- AV navigation equipment
- Operating environment simulation systems
- Audio playback decks
- ECUs

Fujitsu Media Devices

- Performance polymer capacitors

Fujitsu CoWorCo

- ZEBO series


Scanner F1-4340C (PFU)


AV navigation equipment AVN5501D (Fujitsu Ten)


Security FW-P


Performance polymer capacitor FPCAP RE series (Fujitsu Media Devices)


UNIX server PRIMEPOWER650

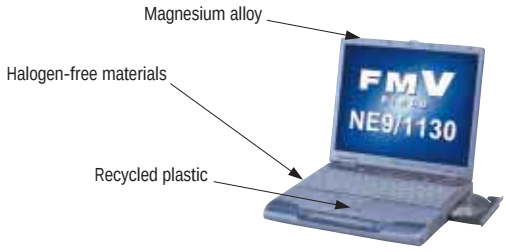

Pen notebook computer PenNote Model TI

*1 Please refer to page 52 for definition.

Examples of Eco-friendly Products

Recycling Technology

- Use of biodegradable plastic parts in notebook computers
  Since spring 2002, we have used biodegradable plastic for small notebook computer parts. Made from a polylactic acid derived from corn, the plastic is broken down into just carbon dioxide and water by bacteria in soil.
- Recycled plastic
  We have employed recycled plastic in PCs since 1998.



FMV-BIBLO NE-series

- Recyclable paint
  We have employed recyclable paint to coat desktop PCs since 1999.
- Magnesium alloy
  We have developed technology to recycle unused parts from assembly processes that use computer casings made of magnesium alloy. We have employed such recycled materials since 1999 in the production of notebook PCs (manufactured by Fujitsu Kasei).

FMV-DESKPOWER C-series

Reductions in Chemicals

- Lead-free solder
  Our goal is to eliminate the use of lead solder from all our products. All new products use lead-free solder varieties.

New lead-free solder applications in fiscal 2001

Model name	Starting term
Desktop PCs (FMV-SL series, FMV-CL series)	April 2001
Notebook computers (LOOX-T series, S series, LIFEBOOK MC series, LS series)	May 2001
Mobile terminals (mobile phones)	June 2001
HDDs (2.5-inch, 3.5-inch)	July 2001
Opto-magnetic disk equipment	September 2001
Telecommunications-use onboard power supplies (Fujitsu Denso)	January 2002
Routers (Si-R150)	March 2002

Types of solder used Sn-3.0Ag-0.5Cu

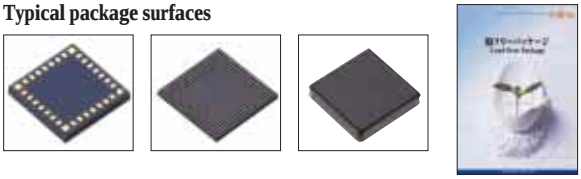
Application of lead-free solder in electronic devices

We introduced lead-free solder in LSI products in October 2000. By the end of 2001, the number of LSI products employing lead-free solder shipped had topped 50 million units.

Technology development

- New lead-free soldering materials use tin, silver, copper and bismuth (Sn-Ag-Cu, Sn-Bi-Ag, Sn-Bi)
- Surface-mount reliability testing (thermal cycle, adhesive strength, PCB repetitive bending/dropping tests)
- Enhanced package thermal durability (assessment of thermal durability, plus improvements in materials and pattern designs)

Typical package surfaces



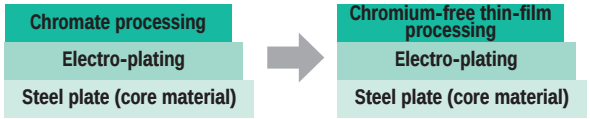
edevice.fujitsu.com/fj/CATALOG/PDF/a81000044c.pdf

Development of medium-temperature lead-free soldering material

We developed a new medium-temperature solder from an alloy of tin, zinc and aluminum (m.p. of 199) to use as a lead-free alternative in PCB unit production. Patents have been filed in eight countries, including Japan, and a U.S. patent has already been approved.

- Introduction of non-chrome steel plate
  We have employed a special type of non-chrome steel plate containing no hexavalent chromium compounds in the production of desktop computer casings and panels.

Steel plate cross-section



Conventional product Chrome-free product

- Use of halogen-free materials
  We use only phosphorus-based flame retardants made from halogen-free resins in the plastic casings of our notebook computers.
- Use of soy oil-based inks in packaging materials
  We have switched to the use of eco-friendly soy oil-based inks (with the permission of the American Soybean Association) for printing the cardboard packaging employed for PCs and other products. These biodegradable inks impose a smaller environmental burden. The change also helps to restrict atmospheric pollution by VOCs (volatile organic chemicals) used in conventional printing inks.

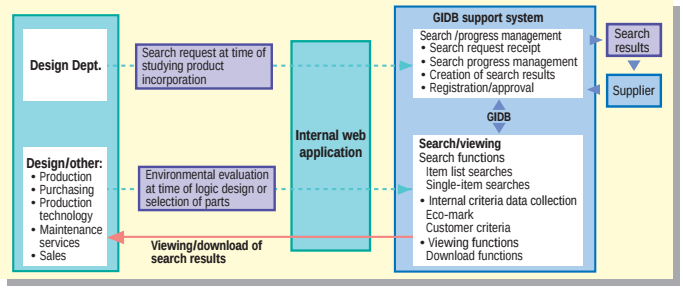
Packaging printed using soy oil-based inks

Green Product Development

Promoting purchasing and use of eco-friendly parts

We have begun compiling a database (GIDB, the Green Information Database) of environmental information on procured parts to use in building eco-friendly characteristics into products at the development/design stage. In fiscal 2001, we examined approximately 36,000 parts in conjunction with the parts use commissioning system and design information system.

GIDB/support system development



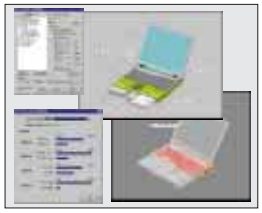
LCA*1 (Life Cycle Assessment)

We design products with the prevention of global warming in mind by promoting the use of LCA to assess the environmental burden imposed by products throughout their life cycle. In fiscal 2001, we extended LCA to all Green Products, standardizing the application of LCA-based assessment criteria.

Products Currently Covered by LCA (41 models)

- Disk arrays
- Notebook computers
- Routers
- Desktop PCs
- CRT/LCD displays
- Opto-magnetic disks
- Printers
- VoIP gateways
- LCD units
- Servers
- Distribution terminals
- FOMA mobile phone handsets
- Security devices

• Evaluation tools
We employ an original VPS software that enables us to assess CO_2 emissions in real time in conjunction with 3-D CAD techniques as an LCA support tool for designers.



Example of evaluation using VPS/ECODESIGN software

Furthermore, as a new trial, we selected other environmental burdens besides CO_2 emissions and conducted LCA in connection with notebook PCs in order to develop products from the perspective of overall reduction of the environmental burden, including global warming, resources consumption, acidification and eutrophication as well as prevention of global warming.

Environmental burden assessment for a notebook PC model (FMV-6750NA8/L)

Consumption burden	Energy (MJ)	7.92E + 02	8.61E + 01	6.75E – 05	2.80E + 03	– 5.72E + 01
	Water (L)	3.57E – 03	2.07E + 01	—	—	– 4.72E + 02
	Life Cycle Stage	Production (materials)	Production (product)	Distribution	Use	Disposal/recycling
Emission burden	CO_2 (g)	4.61E + 04	5.45E + 03	4.76E – 03	1.24E + 05	– 4.04E + 03
	COD (g)	3.15E – 01	2.50E – 01	—	—	5.00E – 03

Consideration for Customers

Promotion of Energy Saving in Products

Our entire line of personal computers now conforms to the energy-saving performance standards for fiscal 2005 as stipulated in Japan's Law Concerning Rational Use of Energy.

- We mark all products that have cleared the energy-saving standard with a special logo.

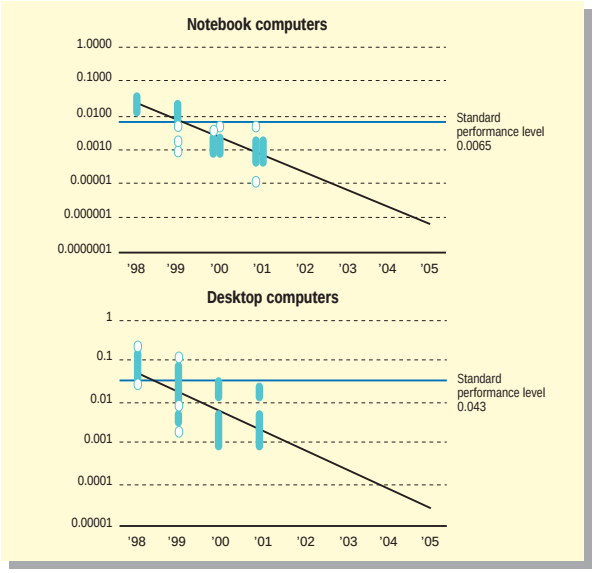
CLEAR 2005
省エネ法目標達成！

- All these products also conform to the joint U.S.-Japan standard for standby-mode energy consumption specified in the International Energy Star Program.

Number of products registered with the International Energy Star Program in fiscal 2001 (550 models)

Electronic calculators	499	Displays	26
Printers	21	Scanners	4

Energy consumption efficiency by personal computers:



*1 Please refer to page 52 for definition.

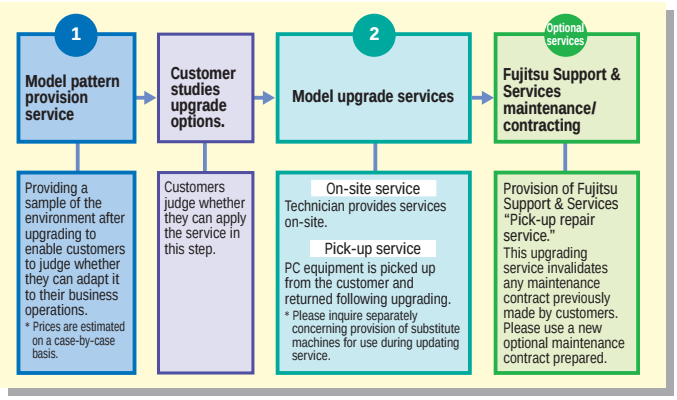
Services Targeting Long-term Customer Use

PC upgrade services by Fujitsu Support & Services

Fujitsu Support & Services provides exchange and installation services to upgrade old PCs with new memory, HDDs or CPUs. This enables customers to receive a faster computer without purchasing a completely new machine.

- Service flow:
  ❶ Customers are provided with a model pattern for service provision to construct a sample of the environment after upgrading, which they use to judge whether they can adapt it to their business operations. ❷ Upgrading service is provided.

PC upgrading services (Fujitsu Support & Services)



Disclosure of Environmental Information

We seek to provide customers with useful environmental data concerning products at the point of purchase by means of eco-labels in accordance with accepted labeling systems certified by third-party organizations.

Products conforming to the Law on Promoting Green Purchasing

The Green Purchasing Network, a Japan-wide network of consumers, corporations and administrative bodies organized to promote green purchasing, provides online information concerning products such as servers, workstations, desktop PCs, notebook PCs, magnetic disks and printers conforming with the Law Concerning the Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Law on Promoting Green Purchasing), implemented in April 2001.

Eco-mark (Type I)

In January 2001, Fujitsu became the first desktop PC manufacturer in Japan to receive Eco-mark certification from the Japan Environmental Association for its FMV series desktop PCs. A number of models have since been approved for this eco-label.

FMV Desktop Series
Type: FMV6MLB120, etc.
Certification number: 00119005

FMV-BIBLO Series
Type: FMVLT553W3
Certification number: 01119002

FMV-LIFEBOOK Series
Type: FMV8NA4BC0, etc.
Certification number: 01119006

LCD
VL-Series
Type: VL-1700SS, etc.
Certification number: 01119009

eco.fujitsu.com/en/news/2001/eco20010115_e.html

Environmental Emblem (Type II)

This is a Fujitsu Group-approved eco-label we have used in Green Product catalogs and packaging since November 1998 to signify that such products have superior eco-friendly features.

eco.fujitsu.com/en/info/emblem-e.html

3R eco-label for PCs (Type II)

The Japan Electronic Information Technology Association has introduced a special eco-label for personal computers to certify compliance with comprehensive environmental measures, including eco-friendly design, manufacturing and recovery, reuse and recycling of post-use products. We have sought certification to attach the labels to our PCs since mid-2001.

Concept
- Eco-friendly in the design and manufacturing stages
- Targeted recovery, reuse, recycling and appropriate treatment levels for post-use products
- Appropriate information disclosure concerning environment

Fujitsu status
Company assessment successfully completed (September 2001)

Product assessment continuing (since October 2001: registered models 156)

Products covered by JEITA assessments
- Desktop PCs
- Portable notebook computers
- CRT/LCD single-unit PCs
- CRT/LCD monitors

JEMAI pilot program (Type III)

This eco-labeling, certified by the Japan Environmental Management Association for Industry (JEMAI), is accorded to products that display the environmental effect caused by products throughout their life cycle. In September 2001, Fujitsu disclosed information concerning the FMV-BIBLO LIFEBOOK NA notebook computer series (FMV-6750NA8/L).

Registration form

Eco-labeling

Type I: Environmental details concerning products approved by third-party organization following voluntary application by the manufacturer.
Type II: Environmental details concerning products conforming to independent criteria determined by the manufacturer.
Type III: Eco-labeling based on third-party certification (as with Type I), with the quantitative environmental burden imposed by the product indicated on the label.

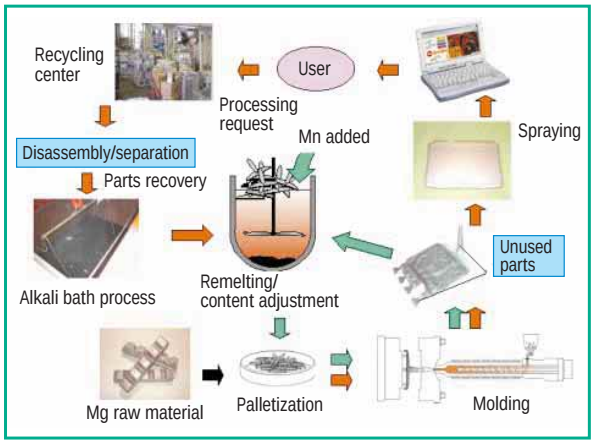
Green Product Development

Environmental Technology Development

We are developing proprietary technologies to further lower the environmental burden imposed by our products. A few of them are introduced here.

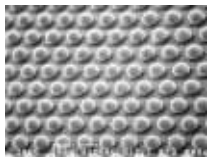
Total recovery and recycling of magnesium

We have developed technology that enables us to recover and recycle the used painted magnesium alloys from PC casings.



AP Bump (advanced printing bump)

It is possible to form minute lead-free solder droplets at lower cost.



AP Bump

pr.fujitsu.com/en/news/2001/12/12-1.html

World's first opto-catalyst eliminates viruses and unpleasant odors with high efficiency.

Working in conjunction with the Research Center for Advanced Science and Technology, The University of Tokyo, we have developed an efficient opto-catalyst*1 by enriching calcium hydroxyapatite*, a substance with excellent absorbency, with titanium ions. This has doubled the efficiency of its catalytic disintegration, which eliminates unpleasant odors and viruses. This new catalyst has potential uses in air-conditioning unit filters and information-processing equipment.

* A type of calcium phosphate, calcium hydroxyapatite is excellent for the specific absorption of organic materials, such as proteins, in inorganic surroundings, such as the bones or teeth of humans and other vertebrates.

Environmental Indicators

We are currently studying the use of environmental indicators. Environmental performance improvement factors assess the total improvement of products by considering the resources input, environmental burden imposed and changes in service performance. We are planning to use the indicators to measure improvements in our PCs' environmental performance and are currently participating in the METI-sponsored Resource Productivity Examination Committee to study their use. We plan to examine which quantitative service changes are necessary for calculating the factors for individual products and to promote expansion of the range of products to which we apply the indicators.

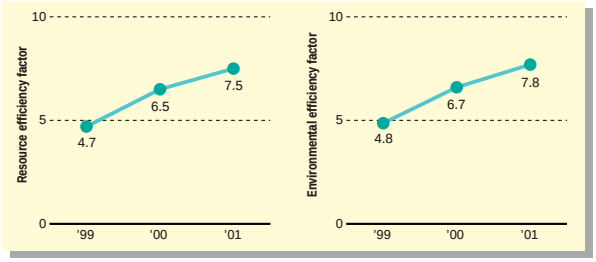
Environmental performance improvement factors

We measure the relative improvement in our new products' resources use and environmental efficiency with respect to earlier products.

- Factor definitions:
  Resources efficiency factor = Service (ratio of new products to old products)/resources input amount (ratio of new products to old products)
  Environmental efficiency factor = Service (ratio of new products to old products)/environmental burden amount (ratio of new products to old products)

- Calculation methods for PCs
  For these calculations, product mass is used as the "resource input amount" and CO_2 emissions over the entire product life cycle as the environmental burden amount." For PC-related "services," quantities such as hardware (CPU) performance or operating software performance (such as HDD capacity) are used.

Example of calculation for PC (FMV-BIBLO LIFEBOOK NA)



These figures indicate that, compared with the original series (1998 products), the resource and environmental efficiencies factors of the 2001 products in the FMV-BIBLO LIFEBOOK NA PC models are 7.5 and 7.8, respectively.

We plan to pursue making every product a Green Product and environmental information disclosure.

*1 Please refer to page 52 for definition.