

# Product Assessment (Environment-friendly Product Development)

Nikon formulated the Nikon Product Assessment system in 1995 to promote the introduction of environment-friendly product development practices based on consideration of the complete life cycles of products. The system has been continuously improved since. The 8<sup>th</sup> update of the system, effected in the year ended March 2007 to reorganize and strengthen measures against hazardous substances, has enhanced the environment-conscious development of products in all production areas.

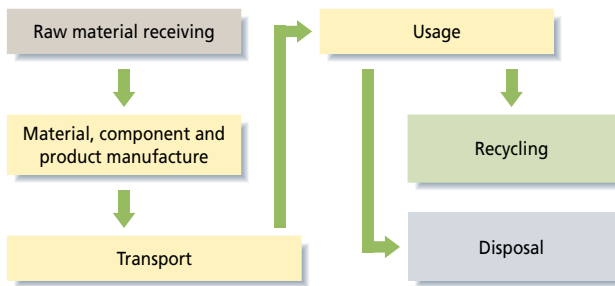
## Nikon Product Assessment

To minimize the adverse environmental effects of our products throughout their life cycles (see diagram below,) Nikon formulated its own product assessment system in 1995.

The Nikon Product Assessment system is now practiced by all product development and design departments. The resulting reductions in the environmental loads of our products have been significant.

Nikon is constantly adding new evaluation items and standards for product assessment. In the year ended March 2007 we introduced a revised system (8<sup>th</sup> update) with reinforced criteria related to hazardous substances. Our product design divisions will redouble their efforts with the goal of more favorable evaluation under assessment by the newest update.

### General Life Cycle for Nikon Products



### Features of Nikon Product Assessment System

- Priority placed on reducing consumption of resources and energy, recycling, long product life, reduction in use of hazardous substances, reduction and simplified processing of waste; disclosure of material information
- Anticipation of emerging global environmental issues and alteration of regulations/rules in foreign countries, and development of Nikon standards that take the characteristics of our products into account
- Formulated after thorough discussion among product development teams, material engineers and other related personnel
- Make product assessment mandatory in design reviews and related phases of product development sequences, with procedures and standards clearly defined
- Vigilance in product improvement from one model to the next
- Support designers by building and maintaining an environmental data book of material information (Eco-glass, plastics, metals, surface treatment materials, bonding agents, etc.,) explanatory text and documentation

### Items Covered Under the Nikon Product Assessment

- Ongoing reductions in product mass, volume, and part counts
- Assessment and improvement of energy consumption based on Nikon's Energy Efficiency formula (product functionality/ power consumed)
- Pursuit of extended product life and simpler repair procedures
- Reduction in the amount of waste generated from consumables; appropriate guidance on waste processing for customers
- Simplified recycling procedures (simpler separation of plastics from metals, content marking/explanation, and simpler removal of rechargeable batteries)
- Avoidance of the use of hazardous substances (heavy metals in materials such as metal, resin, electric wire, electronic components, etc., specific brominated flame retardants and PVC)
- Use of optical glass free of lead and arsenic ▶ See page 41
- Transition to lead-free solder on boards for electronic components ▶ See page 42
- Adoption of surface-treatment technologies free of hexavalent chrome ▶ See page 42
- Elimination of ozone-layer-depleting substances
- Strict observance of environmental laws and regulations (battery regulations, RoHS Directive and others)
- Overall assessment (overall assessment points, comments on evaluation, etc.)

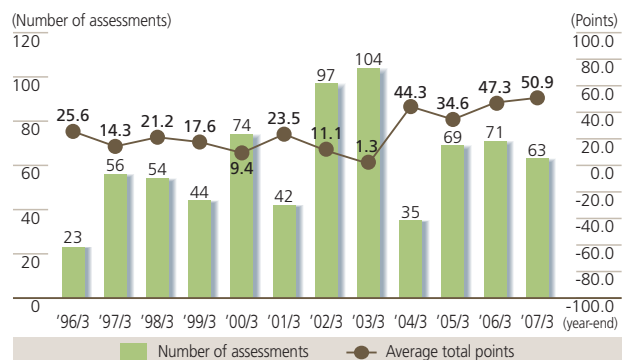
### Results of "Nikon Product Assessment"

If a product shows improved environmental friendliness compared with the prior model, assessment points are awarded. If the environmental friendliness is about the same, no points are given. If the environmental friendliness has deteriorated, points are subtracted. The point scale ranges from -100 to +100.

Over the 12 years from the year ended March 1996 to the year ended March 2007, Nikon performed 726 assessments under this program, obtaining +22.9 points on average. The average points assessed have improved dramatically over the last four years, reaching +44.1, in spite of the enforcement of ever stricter assessment criteria.

Nikon is continuing its efforts to improve and enhance the functionality and performance of all of its products, while releasing new products to the world markets. These assessments confirm the great advances we are achieving through our environmental efforts.

### Product Assessment Results



## Environmental Topics—Activities in the Products

# Environmentally Sound Optical Glass (Eco-glass)

Nikon seeks to minimize the risk of environmental pollution caused by lead and arsenic in optical glasses throughout the entire product lifecycle. ECO-GLASS, our new optical glass free of lead and arsenic, is to be incorporated in the optical systems for all of our products.

### History of Eco-glass Development

Since Nikon was established in 1917 as the first optical glass manufacturer in Japan, we have placed a high priority on the development and manufacture of optical glass designed for use in optical equipment. As part of our anti-pollution efforts, in the 1970s we ceased the use of cadmium—a toxic material—in optical glass.

In the 1990s, we investigated countless optical glass compositions, bearing in mind the possible effects of each on the environment. Approximately 100 types of optical glass contained lead or arsenic. We have recognized that this fact is one of the most significant environmental aspects of our business activities and products. Therefore, we decided to develop a new environmentally sound glass and employ it in our products.

We demanded that the new glass offer optical performance at least equaling that of the glass in use. As such, the optical glass development department and the optical design department initiated a joint effort to investigate a variety of new compositions and design factors. After development was completed and the supply stance solidified, we began introducing Eco-glass into our products. Since the year ended March 1999, we have used the new glass across the board in our optical design department. From the second half of the year ended March 2005, we managed to use Eco-glass in all Imaging Company products, such as cameras.

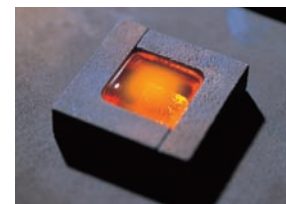
The Nikon Group is undergoing a major shift to eco-glass at the glass manufacturing departments of Nikon and Hikari Glass. During the year ended March 2007, we achieved an Eco-glass utilization rate of over 98% of all glass shipped, at least 950 t, including to non-affiliated companies.

Nikon offers a very extensive range of optical equipment. Because of the sheer diversity, some products incorporate parts that may not accommodate Eco-glass. We will continue to switch over to the new material, however, trying technological limit.

### Eco-glass Development Highlights

- (Year-end)
- 1996: Eco-glass development project launched full-scale.
- 1998: Eco-glass-related items added to Nikon product assessments.
- 1999: Eco-glass database completed; employed across the board in optical design.
- 2000: Development of Eco-glass composition about 80% complete.
- 2001: Development of Eco-glass composition complete.

\*The total cost for R&D to develop Eco-glass is 410 million yen during this term.



Eco-glass development

### Rates of Eco-glass utilisation in new optical designs Unit: %

The Year ended March	All products	Consumer products (Cameras, binoculars, etc.)	Industrial products (IC steppers, microscopes, etc.)
2000	77.1	—	—
2001	86.1	—	—
2002	78.1	—	—
2003	92.2	—	—
2004	94.7	96.6	94.5
2005	95.8	100	95.5
2006	96.8	100	96.5
2007	98.0	100	97.6

\*Rates are calculated based on component units.

### Rates of Eco-glass utilisation in glass manufacturing departments

The Year ended March	Rate	Scope
2001	53.6%	Glass manufacturing at Nikon
2002	75.8%	
2003	83.5%	
2004	87.4% (839/960 t)	Glass manufacturing at Nikon and Hikari Glass
2005	91.7% (989/1079 t)	
2006	93.0% (777.4/836.1 t)	
2007	98.0% (940.1/959.3 t)	

\*Rates are calculated based on amount of all materials shipped

# Lead-free Solder, Surface Treatment, Reductions in Use of Hazardous Substances

As part of reduction in use of hazardous substances in Nikon products, we are promoting adoption of lead-free solder, development of the metal plating technologies to eliminate the use of hexavalent chrome, reduction in use of heavy metals in overall surface treatments including coatings and inks, elimination of use of lead and PVC in cable/wire covering, and avoidance of heavy metal use in metallic, plastic and electronic components.

## Full-scale of Adoption of Lead-Free Solder

Under the auspices of the electronics production lines at Yokohama Plant and Sendai Nikon, we have completed full-scale of adoption of lead-free solders in our product development and manufacturing technologies departments throughout the entire Nikon Group.

Our in-house training and technical certification system for the training of staff on the techniques of manual soldering now includes a course on lead-free soldering procedures, to help our employees master the new technology. Over 500 instructors and qualified staff have been trained in lead-free soldering worldwide.

The majority used at Nikon is the tin-silver-copper alloy that has been most typically used in the industry; however, the lead-free solders are also used for low-temperature tin-silver-indium-bismuth alloy, enabling response to wide range of products.



Lead-free Flow Furnace



Lead-free PCB for advanced immersion-type of IC scanner

### Application of Lead-free Solder to our Products

The use of lead-free solders is being implemented under the Environmental Action Plan (▶ see page 37). Progress has been rapid: Nikon has been using 100% lead-free solder for all of its new consumer products, including the D80 digital SLR camera, since the year ended March 2007.

The use of lead-free solder is also being aggressively promoted for our industrial products (steppers, microscopes, surveying instruments, etc.). More than 90% of our new boards produced since the year ended March 2007 have been soldered with lead-free materials.

## Elimination of Hexavalent Chrome in Surface Treatment

Hexavalent chrome compounds are extremely hazardous, but have been extensively used in metal surface treatment for many years. The surface treatment departments of the Yokohama Plant renewed the technologies and processes used for chromate treatment and chrome plating earlier this decade. Through this effort, the plant completely abolished the use of hexavalent chrome in December 2004.

Based on these results and experiences, Nikon has actively introduced hexavalent-chrome-free surface treatment technologies in all product areas.

The many types of surface treatment used in industry are handled in diverse workplaces with diverse components, and pose wide-ranging problems. Nikon has responded by establishing strict technical standards regarding not only hexavalent chrome, but also lead, cadmium, and mercury. The company's goal is to abolish the use of heavy metals entirely.

### Electro Deposition-painted Threaded Fastener for Camera (Hexavalent-chrome-free)



Matt

Medium Gloss

Glossy Finish

## Reduced Use of Other Hazardous Substances

The Nikon Group is taking steps to abolish the use of hazardous substances such as hexavalent chrome, lead, cadmium, mercury, PBB, PBDE and PVC in its products, as far as technically possible.

We also prepare elaborate data materials for our engineers in product development to alert them to the hazardous substances contained various metals, plastics, and electronic components.

## Environmental Topics—Activities in the Products

# Environmentally Friendly Product Development Systems and Examples of Products

Nikon promotes continuous and ambitious improvements in the environmental performance of its products through its own system for managing environment-friendly designs. Several environment-friendly products released by Nikon in the year ended March 2007 are shown below, by way of example.

### Environment-friendly Product Development System

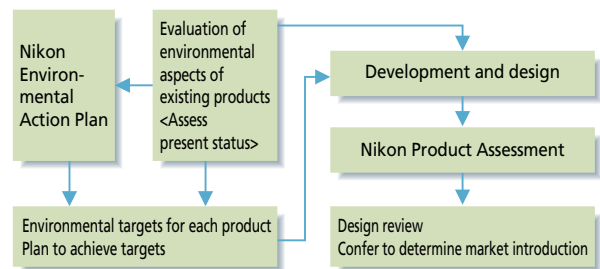
Nikon has steadily developed and implemented a system for managing environment-friendly product designs while reinforcing the Nikon Environmental Action Plan and Nikon Product Assessments.

Under this system, Nikon and its Group Company are developing more environmentally conscious products with a commitment to aggressive increasing energy efficiency, major advances in the conservation of global resources, the minimal use of hazardous substances, and the maximum application of Eco-glass, lead-free solders, and technologies for hexavalent-chrome-free plating.

By March 2006, we completed preparations to meet the standards of the EU RoHS Directive\* that were to take effect four months later, in July of the same year.

\*RoHS Directive: Applies to an extensive range of electrical and electronic products sold in Europe, excluding certain materials and products which have no substitutes. In principle, the Directive prohibits the sale of products containing hexavalent chrome, lead, cadmium, mercury, PBB, and PBDE in European markets. The Directive has been enforced since July 2006.

### Management System Flow of Environment-Friendly Product Design



### Examples of Products

#### Precision Equipment Company Products

##### ■ IC Scanner NSR-S610C (sales started on February 2007)

Designed with a projection lens of the world's highest standard with an ultra-high N.A. of 1.30, this state-of-the-art ArF immersion-type scanner is suitable for the mass production of the most advanced 45 nm or finer line-width devices.

The protection of the global environment remains a top priority for this strategic product incorporating Nikon's finest immersion-exposure technologies. Nikon engineers design their optical systems with Eco-glass insofar as possible, and adopt boards fabricated with lead-free solder.

- Energy efficiency** 96% higher than the NSR-S307E in exposure of a 300 mm wafer (internal reference)
- Ozone layer protection** New HFC refrigerant with zero ODP (Ozone-depletion Potential) used for temperature control and air conditioning chillers
- Lead-free solder** 93% or more of new designed boards use lead-free solder
- Elimination of hexavalent chrome** Use of hexavalent chrome was abolished in surface treatment process of the components specified in drawings
- Eco-glass usage** 99%

\*Nikon steppers/scanners have introduced a new era in design rule shrink IC manufacture, and made major contributions to continuing improvements in resource utilisation efficiency.



IC Scanner NSR-S610C

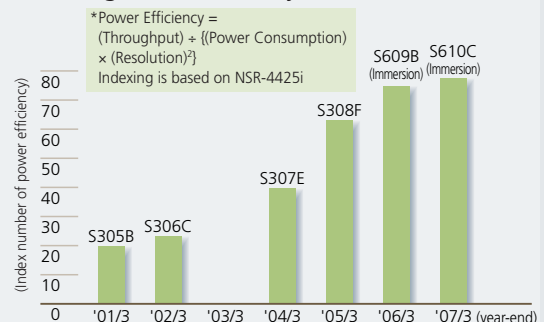
##### Increasing Energy Efficiency of NSR-series IC Steppers/Scanners

Nikon advances IC steppers/scanners design and manufacturing innovation with a finer IC pattern designed to raise resolution of projection optics systems, accommodate larger wafer sizes and enhance throughput to increase the number of IC cells that can be exposed within a given time.

Nikon has reinforced its product lineup by consistently developing advanced models incorporating the i-line (mercury lamp), KrF (Krypton fluoride excimer laser), and ArF (Argon fluoride excimer laser) as exposure light sources for higher resolutions.

These higher-performance models also offer outstanding energy efficiency, enabling significant increases in the numbers of IC cells exposed per unit of power consumed. Nikon has succeeded outstandingly in its ongoing efforts to address the power consumption issues accompanying the improved performance.

##### Increasing Power Efficiency of ArF-series



## Imaging Company Products

### ■ Digital SLR camera D40 (marketed in December 2006)

This entry-level digital SLR camera offers 6.2 effective megapixel resolution, together with a compact, lightweight design, reasonable price, and simplicity of use.

Energy efficiency	74% higher than the D50, with a battery only one-third the size
Reduced mass	12% mass reduction from the D50 (540g → 475g)
Reduced dimensions	Approx. 39% volume reduction from the D50 (133 × 102 × 71 mm → 126 × 94 × 64 mm)
Lead-free solder	All electronic circuit boards use lead-free solder
Reduction of hazardous substances	Complies with RoHS Directive baseline
Eco-glass usage	100%



Digital SLR camera D40

### ■ Digital camera COOLPIX S200 (marketed in March 2007)

This compact DSC (digital still camera) is designed with an aluminum alloy body, 3× zoom lens, 7.1-megapixel CCD, and large 2.5-inch LCD (liquid crystal display.) The attractively priced device offers diverse functions, including an anti-vibration mode with “electronic vibration reduction (e-VR),” “supersensitive ISO 1000” and Nikon’s proprietary “BSS” and “face-clear function” for capturing cleaner portrait shots based on a face-detection AF (autofocus) technology.

Energy efficiency	120% higher than the COOLPIX 5200, even with the increased pixel count and anti-vibration function
Lead-free solder	All electronic circuit boards use lead-free solder
Reduction of hazardous substances	Complies with RoHS Directive baseline
Eco-glass usage	100%



Digital camera COOLPIX S200

### ■ Digital camera COOLPIX S500 (marketed in March 2007)

This compact DSC features the world smallest stainless-steel body, a 3× zoom lens, a 7.1-megapixel CCD, a large 2.5-inch LCD (liquid crystal display), and the world’s most rapid operation (time lag from start to release.) The functions in this attractively priced device include an anti-vibration mode with a combination of “optical-shifting vibration reduction (VR),” “supersensitive ISO 2000,” and Nikon’s proprietary “BSS” and “face-detection AF.”

Energy efficiency	70% higher than the COOLPIX 5200, even with the higher pixel count, faster operation speed, and anti-vibration function
Lead-free solder	All electronic circuit boards use lead-free solder
Reduction of hazardous substances	Complies with RoHS Directive baseline
Eco-glass usage	100%



Digital camera COOLPIX S500

### ■ Interchangeable lens AF-S VR DX Zoom-Nikkor ED 55-200mm f/4-5.6G (IF) (marketed in March 2007)

This high-performance telescopic zoom lens is compact, light-weight, and the first to be equipped with a VR function among products in its price class. Nikon’s leading-edge technologies such as VR and SWM enable use for versatile purposes.

Reduced mass	40% (225g) mass reduction from the AF-S VR DX Zoom-Nikkor ED 18-200mm f/3.5-5.6G (IF)
Lead-free solder	All electronic circuit boards use lead-free solder
Reduction of hazardous substances	Complies with RoHS Directive baseline
Eco-glass usage	100%



Interchangeable lens AF-S VR DX Zoom-Nikkor ED 55-200mm f/4-5.6G (IF)



## Environmental Topics—Activities in the Products

# Environmentally Friendly Product Development Systems and Examples of Products

### Instruments Company Products

#### ■ CNC Video Measuring System iNEXIV VMA-2520 (marketed in January 2007)

This popular multipurpose automatic measurement system is designed with a wide-field 10x zoom optical system, LED ring light, automatic control stage, optical head with attachments for a laser AF and touch probe, new image-treatment technologies, and more.

Countermeasures against hazardous substances have resulted in improved environmental performance by maximum use of aluminum alloy and LED lights, full-scale adoption of Eco-glass and lead-free solder, and the abolishment of PVC in the molded coverings.

Reduced mass	64% less mass at the body, 58% less mass at the controller than the VMR-3020
Recyclability	All major components are made of aluminum alloy
Energy efficiency	40% higher than the VMR-3020
Reduction in consumable supplies	Not halogen lamp but long-life LED is used for all sources of lights
Lead-free solder	All electronic circuit boards use lead-free solder
Eco-glass usage	100%



CNC Video Measuring System  
iNEXIV VMA-2520

#### ■ Wafer Inspection System OPTISTATION-3000 (marketed in September 2006)

This extremely user-friendly device enables the rapid and easy manual inspection of 300 mm wafers. One machine can convey both 200 mm and 300 mm wafers to meet the needs of semiconductor post-processes.

Pared down functionality leads to vastly improved energy efficiency. Eco-glass and lead-free solder are also used.

Energy efficiency	42% higher than the OPTISTATION-3100
Reduction of hazardous substances	Plastic parts and sheet boards do not use PBB, PBDE, cadmium, lead and PVC
Lead-free solder	A lot of electronic circuit boards use lead-free solder
Eco-glass usage	100%



Wafer Inspection System  
OPTISTATION-3000

### Nikon Group Products

#### ■ Sportstar EX 8×25D CF/10×25D CF (marketed in October 2006)

These compact, light-weight, waterproof binoculars can be folded into a slim body. Full-scale waterproof specs are achieved by filling the body with nitrogen gas to prevent hazing and molding of the optical system. The wide-field optical system makes it easier to capture targets, and the multilayer coating secures a clear and bright field of vision.

Reduced mass	7% less mass at the volume and number of parts than the Sportstar IV (8 × 25)
Common use of components	Sharing 75% of the components with "Sportstar IX" (8 × 25)
Long-life design	Waterproof construction with nitrogen gas filling prevents raindrops from entering
Reduction of hazardous substances	Elimination of PVC, hexavalent chrome and other hazardous substances, in body, case and strap, according to Nikon Green Procurement Standards
Eco-glass usage	100%



Sportstar EX

# Reuse and Recycle of Used Products

Nikon, which supplies its products worldwide, is working tirelessly to reduce the total environmental impact of its products and services through reuse and recycle of used products, paying strict attention to sales and distribution activities.

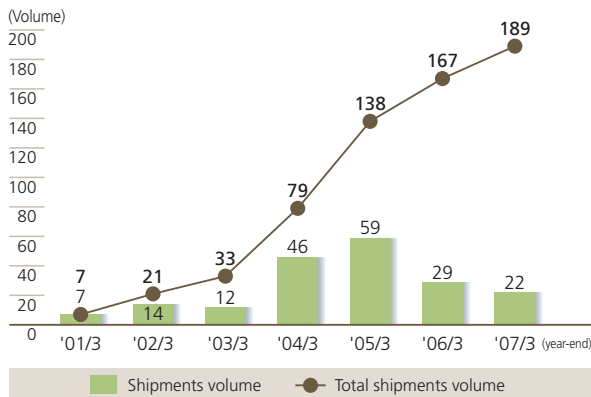
## Sales of Refurbished Steppers for Reuse

Since the year ended March 2001, Nikon has got in operation of collecting used steppers discarded by customers, then reproducing, reconditioning and reselling them for new users, in Japan and overseas, with appropriate services supplied. This is an example of Nikon's willingness and capability to reuse its own products and we can accomplish both social contribution and customer satisfaction through this business. Therefore, Nikon has strongly enhanced it while continuously reinforcing its reuse system as one of important operations to secure stable income, unlike new product business with wide variation in sales results.

Thirty-three steppers were shipped in the period from the year ended March 2001 to the year ended March 2003 followed by 46 steppers in the year ended March 2004, and 59 steppers in the year ended March 2005. Although fewer steppers were shipped in the year ended March 2007 than in the previous year, the total volume of shipments had reached 189 units by the end of the year ended March 2007.

The departments, taking charge of the reproduction and reconditioning processes, are making efforts to promote maintenance/improvement of tools and equipment, standardizing of the workflow and increasing its efficiency and putting in place a framework for technical troubleshooting.

Sales Volume of Nikon Refurbished Steppers



The popular NSR-2205i 12D was initially marketed in 1996.

## Recycling of Batteries

### In Japan

Nikon and many other companies have engaged in cooperative efforts with JBRC\* (Japan Battery Recycling Center) to collect and recycle rechargeable batteries for Nikon digital cameras and other products discarded by consumers.

\*JBRC: an incorporated intermediate corporation (with limited liability) to promote recycling of compact rechargeable batteries based on the Act on the Promotion of Effective Utilization of Resources

### In Europe

Our subsidiaries participate in recycling associations that collect and recycle used camera batteries according to local rules and regulations of each nation.

## Recycling of Used Nikon Products

The WEEE Directive\* issued by the EU guides nations to enact laws and regulations as well as establish used product collection/recycling systems. Accordingly, Nikon's European subsidiaries, led by that in the Netherlands, prepared to accommodate enforcement of such new laws and regulations for collection/recycling of digital cameras and other Nikon products in respective markets.

By the end of March 2006, Nikon established its collecting and recycling system in 15 countries in Europe including Netherlands, Germany, Sweden and Spain and has participated in or registered with collection organizations in 5 nations including UK, France and Poland since the year ended March 2007.



Recycling mark in EU

\*The WEEE Directive: the Directive on Waste Electrical and Electronic Equipment established by EU, requiring manufacturers to collect and recycle used products in many categories of electrical and electronic equipment after August 2005.

## Environmental Topics—Activities in the Products

# Environmental-Friendly Packaging and Distribution

Nikon strives to reduce the cost for packaging materials and distribution procedures while takes effective measures against reduction of environmental loading according to the Environment Action Plan.

### Measures for Packaging

Nikon defined its “Environmental Policy Regarding Packaging Materials” in May 1998, and revised it in June 2000. This policy has seven main points:

- Elimination of hazardous substances
- Reduction in volume and content
- Recyclability
- Safety and ease of separation of materials
- Use of recycled resources
- Reusability
- Marking regarding packaging materials and handling precautions

On the basis of those main points, Imaging Company is taking steps to raise loading efficiency of distribution. For example, product package dimensions were formulated to maximize utilization of available airplane cargo space. The Company thereby reduced digital SLR camera box sizes by 20%. Also we switched our transportation mode from conventional containers to pallets, eliminating the need for voluminous box packaging.



Pallet transport

### Measures for Distribution in Japan

CO<sub>2</sub> emission, a major cause for global warming, is accelerating partly due to physical distribution in Japan, and increased about 18% from the year ended March 1991 to the year ended March 2006.

Under these conditions, Nikon including major manufacturing subsidiaries has made efforts to identify effective distribution routes/volumes and the amount of CO<sub>2</sub> emission resulted from distribution since the year ended March 2007. The survey showed that Nikon’s annual amount of CO<sub>2</sub> emission caused by distribution in Japan was 1,630 tons.

Nikon Logistics Co., Ltd. (present Nikon Business Service) has given lectures about economical driving techniques to its truck drivers since the year ended March 2007, thereby helping to reduce fuel consumption. Moreover, enlightenment activities to enhance employees’ environmental awareness were implemented at liaison meetings with business partners of distribution.

We will try to reduce CO<sub>2</sub> emission further also by early shift to the trucks with excellent gas mileage and through close relationship with distribution business partners.



Liaison meetings with business partners of distribution

### Reduction in package size of digital SLR cameras



Before improvement

After improvement

### Deployment of Low-pollution Vehicles

Three natural gas vehicles are used for commuter buses at Kumagaya Plant to reduce CO<sub>2</sub> emission.



Natural gas vehicle