

# Environmental Report 2004

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## Editorial Notes

- Reference was made to the Environment Agency's guidelines on environmental reports in drawing up this document.
- The contents of this report are primarily based on activities in the 2003 business year (March 21, 2003 to March 20, 2004). They also include some activities of related companies, past activities etc.
- Yanmar Co., Ltd. underwent business restructuring in 2003 and, as a result, some structures, data representation units, etc. have been changed. Accordingly, some data in this report may vary from those described in our last environmental report, published in December 2003.
- The term Shiga Zone is used in this report to refer to the small engine factories (at Nagahama, Biwa, Yamamoto and Kinomoto) and the precision equipment factories (at Omori and Nagahara) based in and around Shiga Prefecture. Amagasaki Zone refers to the production facilities for large engines based in and around Amagasaki City, Hyogo Prefecture (Amagasaki Plant and Tsukaguchi Marine Engine Factory).

## Greetings

### Greetings

Our company has devoted itself to the waste-free use of energy resources by developing and diffusing extremely energy-efficient, outstandingly economical engines and machinery ever since its founding in 1912, with the consistent goal of creating enriched ways of life for all people through higher food production and industrial productivity.

The Yanmar company has developed in close dialogue with the natural world on both land and sea, recognizing the importance of coexistence from the early days and pioneering clean emission, low noise, low vibration and other advanced environmentally friendly features.

The spectacular social and industrial development of the 20th century has, even so, generated an environmental burden that exceeds the capacity of our physical world. We face a legacy of serious challenges for human society in the 21st century, ranging from global warming to the depletion of resources, environmental destruction and pollution.

The Yanmar group has stated, as its basic environmental philosophy, the commitment to harmonization of development with needs of the global environment, thereby contributing to the sustainable development of society. We are working to achieve these goals. Whether in the development, manufacture or distribution of environmentally friendly products, all company members are encouraged on a daily basis to engage in socially responsible activities that will help to build the sustainable society by reducing environmental load.

The present business year is the third of our second medium-term 5-year plan for environmental protection. We have been reviewing the achievements of the 2003 business year with a view to preparing the third 5-year plan. It gives me pleasure to present a comprehensive overview of those activities of the 2003 business year in this, the third edition of our annual environmental report.

I trust that this report will provide all readers with a thorough understanding of the environmental measures, stance and activities of the Yanmar group. We continue to depend, as ever, on your guidance and support.



Takehito Yamaoka  
President

## Outline of Yanmar

Yanmar Diesel Engine Co., Ltd. became Yanmar Co., Ltd. on July 1st, 2002 to serve as the holding company of the Yanmar group.



Trade Name	Yanmar Co., Ltd.
Head Office	1-32 Chayamachi, Kita-ku, Osaka City
Founded	March 1912
Capital	6.2 billion yen (March 17, 2004)
Chairman	Tadao Yamaoka
President	Tatehito Yamaoka
Turnover	162.6 billion yen (2003 business year)
Employees	2,817 (as of March 20, 2004)

### Our Products

With energy conversion technologies at the core, we research, develop, manufacture, sell and maintain hardware and software for use on land and sea and in other living spaces.



#### Industrial

- Industrial Engines
- Construction Machinery
- Industrial Equipment



#### Energy

- Power Generation Equipment ; cogeneration systems
- Gas Heat Pumps
- Micro-gas Cogeneration



#### Agriculture

- Farm Machinery
- Farm Facilities
- Hobby Farming Machinery
- Unmanned Helicopters



#### Marine

- Pleasure boats
- Fish Farming
- Marine main & aux. engines



#### Environmental Protection

- Environmental system
- Garbage treatment equipment
- Cool containers
- Golf carts, etc.
- Household equipment

# I . Environmental Management Systems

## 1.1 Yanmar's Global Environmental Pledge (Revised 2002 Edition)

Yanmar Co., Ltd. has long tackled environmental problems in its daily business activities on the basis of the company's corporate philosophy of seeking beautiful harmony between plentiful human lifestyles and the needs of the global environment.

Global warming, acid rain, waste and other problems all continue to pose serious threats to the global environment and society demands that countermeasures be taken.

Yanmar Co., Ltd. made its Environmental Pledge in 1995, and earned ISO environmental certification for all of its production plants in 1998. Much environmental work has already been done. In 2002, with the reinforcement of management structures across the Yanmar group, the Environmental Pledge has been revised as the pledge of the whole group, with the aim of furthering environmental management group-wide.

This pledge today serves as the environmental constitution for improving environmental management throughout the Yanmar group. The group is united in its efforts to promote environmental protection activities at every place of business.

### Corporate Philosophy

**We the Yanmar Group seek through creative technologies and human warmth to give the world new worth and enrich the lives of people everywhere in beautiful harmony with the global environment.**

### Environmental Philosophy

**The Yanmar Group aims through building a harmonious relationship between the group's development and global environmental protection to contribute to the sustainable development of society.**

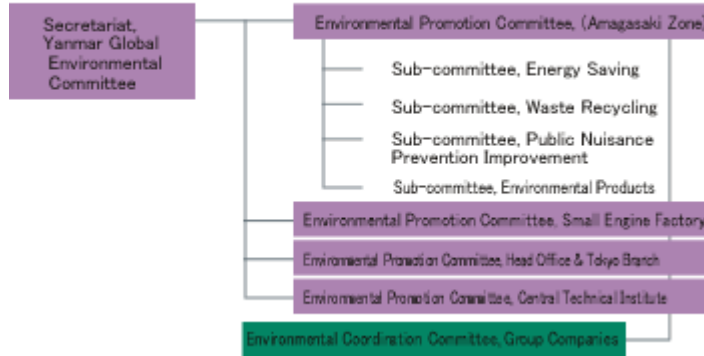
### Action Guidelines

1. We position environmental preservation as one of the most important management objectives of the Yanmar Group for the purpose of group-wide environment management.
2. We strictly observe the laws of all countries and the ordinances and regulations of all districts where we conduct production activities and when necessary establish voluntary environmental regulation in order to achieve higher levels of environmental preservation.
3. The Yanmar Group Global Environment Committee establishes the environmental promotion guidelines and disseminates them throughout the group for the overall promotion of environment preservation by the group.
4. We actively disseminate environmental preservation information internally and externally to deepen the understanding of group companies and partners for cooperation in the promotion of efficient environmental preservation activities.
5. We promote effective measures systematically and on a continuous basis in the following four environmental fields:
  - Establishing technologies that contribute to environmental preservation and products and services that decrease environmental load.
  - Reducing environmental load in each stage of business operations
  - Tying up and cooperating with external parties to contribute to local communities and disseminate environmental information.
  - Raising environmental awareness among employees, internal environmental education, lifestyle innovation, etc.

## 1.2 Implementation Structures

An Environmental Committee is established in each business division with the participation of top management, having the role of establishing environmental management founded on clearly stated responsibilities and rights. An Environmental Promotion Committee and sub-committees by category are further established in each business division and at each site to promote and realize tangible environmental protection activities. Here, we describe the example of the organizational structure of the Environmental Committee of Yanmar Co., Ltd, at the heart of the group. The Environmental Promotion Committee coordinates promotion at each site and oversees the smooth overall implementation of promotion activities.

### Yanmar Global Environmental Committee Organization



The Yanmar Group Environmental Committee was also established in May 2002 with the participation of top executives from the group's companies. It is working to implement group-wide policy with clearly stated lines of responsibility and rights. At each group company, too, an Environmental Committee has been established to promote and implement environmental protection under the responsibility of top management.

### Yanmar Group Global Environmental Committee Organization



Global Environmental Committee, Group Companies



Environmental Coordination Committee, Group Companies

### 1.3 Certification of the Environmental Management System

Our company's environmental management system is implemented for accreditation under the international ISO 14001 standard in the course of promoting full, defect-free environmental protection activities.

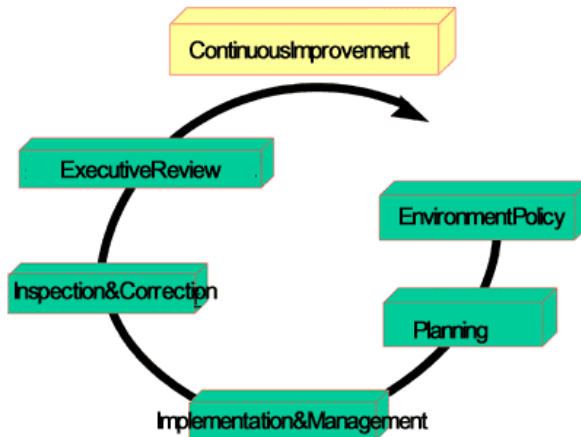
#### What is ISO 14001?

This is the standard for environmental management laid down by the International Standard Organization (ISO).

#### How is a Company Certified?

Certification is performed by a third party organ, which inspects to see whether the standards have been satisfied.

#### ■ Continuous Improvement Under ISO14001 ■



#### ISO Certification by Site

##### ▪ Large Engine and Marine Factories

(Amagasaki and Tsukaguchi Plants) Amagasaki Zone

- Certified: June, 1997
- Certification No.: 770250 Issuer: LRQA

##### ▪ Small Engine and Precision Machinery Factories ...

(Nagahama, Biwa, Yamamoto, Omori, Nagahara, and Kinomoto plants) Shiga Zone

- Certified: March, 1998
- Certification No.: JQA-E-90134 Issuer: JQA

#### Certification of Group Companies and Overseas Production Companies

##### ▪ Yanmar Agricultural Machinery Mfg. Co., Ltd. (Head Office: Ibuki Plant)

- Certified: March 1999
- Certification No.: 4002304 Issuer: LRQA

##### ▪ Kanzaki Kogyokoki

- Certified: March, 1999
- Certification No.: 772501 Issuer: LRQA

##### ▪ Seirei Industry (Okayama, Kochi and Fukuoka Plants)

- Certified: December, 1998
- Certification No.: JQA-EM0277 (Okayama) Issuer: JQA
- Certification No.: JQA-EM0262 (Kochi) Issuer: JQA
- Certification No.: JQA-EM0281 (Fukuoka) Issuer: JQA

##### ▪ P.T. Yanmar Diesel Indonesia

- Certified: July 2003
- Certification No.: 2032854 Issuer: KEMA Quality B.V

##### ▪ Matsue Diesel

- Certified: August 2003
- Certification No.: JBC-4002315 Issuer: LRQA

##### ▪ New Delta Industry

- Certified: May 2004
- Certification No.: JICQA-E840 Issuer: JICQA

## 1.4 Audit of Environmental Management System

The sites certified under ISO14001 disclose their respective environmental policies to the public and perform audits on a periodical basis to ensure their effectiveness and sustainability.



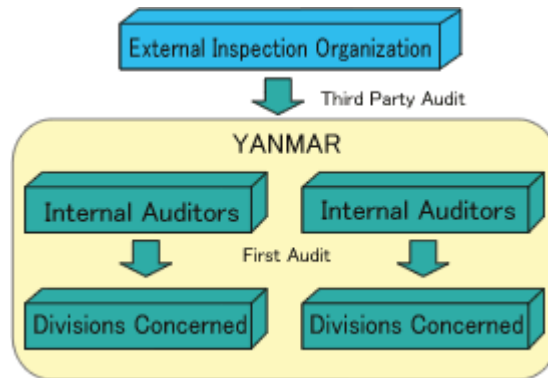
Environmental Policy in the Shiga Zone



Environmental Policy in the Amagasaki Zone

Audits are conducted both internally, to establish whether the environmental management systems are functioning effectively, and, on the basis of the results, by external third party audit according to the ISO 14001 requirements.

### ■ Environmental Inspection System ■



### Results of the Environmental Audit

We conduct an annual internal audit of all divisions throughout the company. The results are reported to the general manager of the business division for use in the environmental control review. We also receive a surveillance and certificate renewal audit by a third party certification organization. In 2003, we were instructed to improve two items and complied with those requests. Other requests were made regarding 43 items, and we enhanced our environment control system accordingly.



## II . Environmental Products

### 1. Industrial Products

#### (a) Vertical Water-cooled Diesel Engines (TNV Series)

The Yanmar TNV series line up of 6–65kW engines is working worldwide not only in Yanmar products but in all kinds of machinery that require engine power, and they have a fine reputation for economy, reliability and environmental performance. It goes without saying that these clean engines satisfy the U.S. E.P.A. Tier Two regulations introduced in 2004 (2005 for sub-19kW units) and other such regulations around the globe.

#### Still Diesel Today, Still Diesel Tomorrow

The diesel engine in Japan long had a mixed reputation. On the one hand, it was a heavy-duty prime mover; on the other, its environmental image was quite poor. The improved engines of today have made people see the diesel with new eyes. All around the world, the diesel is now recognized as one of the most environmentally friendly engine options. Yanmar, as a diesel specialist, is polishing those advantages in R&D to achieve still lower emissions, vibration and noise.

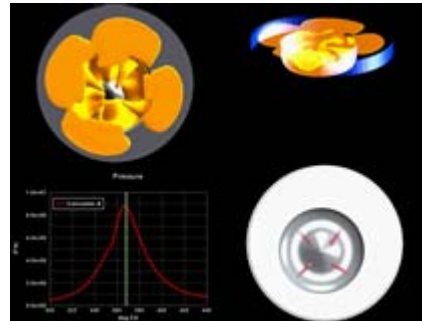
#### The TNV Series

The TNV series is based on the former TNE series, itself a result of many years of accumulated technologies and the most advanced analytical techniques. The new models have been created to clear not only current but future regulations as well. This is a promise of outstanding reinstallation capability without major re-engineering work for years to come.

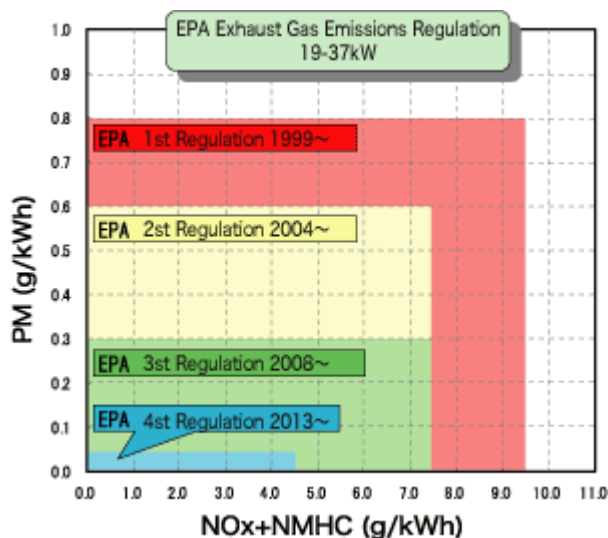


**Eiji Michigami, Mgr., Engine Development**

The environmental image of diesel engines in Japan is still very poor, but I was surprised to see that so many diesels are used in Europe. Very popular luxury, family and sports cars in Japan use diesels. All give excellent performance. My aim is to develop superior diesels for many applications.



Analysis of diesel fuel spray and combustion



TNV diesel engines

## (b) Ultra-small Radius Turning Excavators ( $\Sigma$ series)

We see our ultra-small radius turning excavators, the Sigma series, working at restricted urban sites, digging ditches beside walls, and laying water or gas pipes and sewage tanks at house construction sites. The first B3 sigma and B6 sigma models were released in 1998. These models have been welcomed in the market. They feature a bucket interference prevention mechanism and almost no change of digging depth when the implement is offset. These excavators were developed for environmental friendliness. They feature:



**Mineaki Ogata, Construction Machinery Development**

We achieved the Upper Blow as a result of trial & error in the radiator exhaust direction and heat balance combination

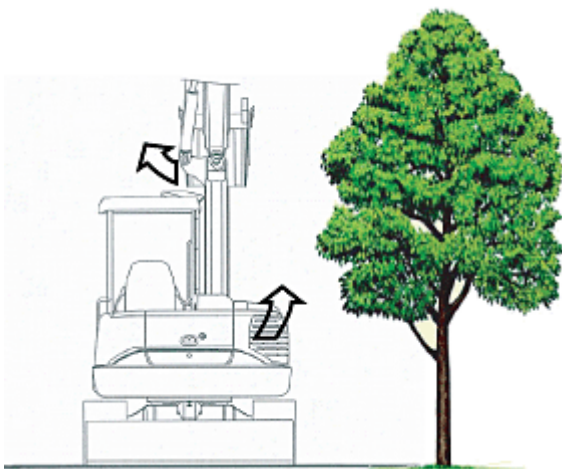
### 1) Consideration for the Surroundings

The exhaust gas from the radiator is discharged diagonally upward, (upper blower), and the engine's exhaust gas is discharged from the cabin's ceiling, (corner post muffler). We try not to cause nuisance to the people in the neighborhood and not to direct hot exhaust onto plants.

### 2) Clearance of the Ultra Quiet Regulation Level of the Land & Traffic Ministry.

### 3) Engines that comply with EPA 2nd Tier regulation ahead of our competitors.

### 4) Use of steel plates, which are easier to repair, for exterior parts that are liable to damage (resource-saving).



Exhaust system friendly to the environment



B6 Excavator

## 2.2Energy

### (a)Gas Engine Micro Co-generation System, CP10VB

The gas engine micro cogeneration system supplies both electricity and heat by driving the power generating equipment from the engine and recovering the engine's waste heat in the form of hot water.

The CP series, which is geared with the inverter system, lines up the 5, 9.8 and 22kW models. The current CP10VB (9.8kW) model, with the use of the highly efficient gas engine and inverter and the permanent magnetic generator, has achieved the highest power generation efficiency in its class of 31% (25% in the conventional model) and the highest overall efficiency of 85%. The maintenance interval has been extended from 6,000 hrs. to 10,000 hrs.

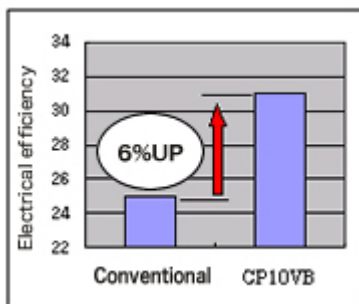


**Kazutoshi Inayoshi, Development,  
Yanmar Energy System**

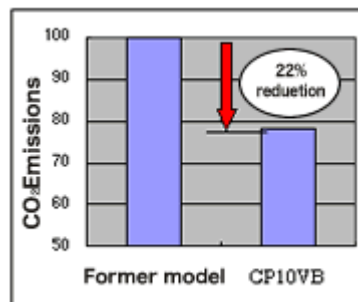
The CP series features a very high power generation efficiency of 31%. I'm sure it will be used widely.

### Environmental Performance

- Natural gas emits 25% less carbon dioxide than light oil.
- The overall system efficiency, for electricity plus heat, is 85%. The CO<sub>2</sub> emissions of the system can be reduced by about 22% compared with commercial power. (Commercial Power CO<sub>2</sub> Emissions Unit Requirement: 0.6kg-CO<sub>2</sub>/kWh, Average of Thermal Power Station)
- The operation noise is 54dB(A), which represents the quietest level in the industry—a very gentle system for the environment.



Power Generation Efficiency



CO<sub>2</sub> Emissions



CP10VB Package

## (b) GHP with Self-Cleaning Function, (Renewed Units)

The service life of air conditioners is 13–15 years, while that of ordinary buildings is 50–60 years. Accordingly, the air conditioners must be renewed 3–5 times.

When renewing air conditioners conventionally, the piping must be renewed, too, since old refrigerant oil, metal powder, etc. remain inside the piping.

We recently developed, the first in the industry, a GHP that cleans the old piping automatically.

### Features

1. Self-cleaning and old oil collection and storage.
2. Renewal is possible for all GHP and EHP models
3. Automatic cleaning. No special personnel training required.

### Environmental Performance

1. The refrigerant piping and wires already installed can be re-used, bringing effective use of resources by curtailing the considerable waste usually associated with air conditioner renewals.
2. The current F series has come a long way in improved energy efficiency from our GHP units of a decade ago. Energy consumption, CO<sub>2</sub> emissions and running costs are all about 40% lower.



Multi YRZP355F1 (13HP) for Use with Bldg. Renewals



**Ikuo Mizuno, Development, Yanmar Energy System**

I remember the campaign a few years ago, named Do not Forget the Importance of Things. This concept is important to save mankind from environmental destruction and food crises. The Yanmar replacement units re-use old piping and wiring

## 2.3 Agriculture

### (a)EF200 Series Tractor (ECO Tractor, Justy)

The EF200 series represents a full model change version of the 20hp tractor models, the principal tractor products of Yanmar. We undertook the thoroughgoing pursuit of basic tractor performance, quality improvement and operational comfort, while always replenishing functions at a reasonable price users can afford. The 20–28hp range is comprised of 5 models (including one new cabin spec. model.)

#### Major Environmental Performance Features of EF200 Series

1. Equipped with the new environment-friendly TNV direct injection diesel engine, it provides high output and low fuel consumption and complies with exhaust emissions regulations.
2. Newly designed integral cabin, the first for the tractors in this class. The full floating structure reduces both vibrations and noise. The standard air conditioner mitigates the fatigue of long hours' duties for comfortable operation at any worksite.
3. The overall transmission case is die cast aluminum. This was made possible by the employment of the 3D CAD FEM strength analysis. In addition, the thoroughgoing reduction of the number of parts items made for a well-balanced lightweight and compact tractor with a long wheelbase. The tractor is best matched with new rotary implement that employs new energy-saving reverse teeth for stable and fuel-efficient plowing performance.
4. Simple operational functions, including an implement turning boosting mechanism, as standard equipment. All levers are concentrated in positions that provide easy operator access.

Customers appreciate the cost-consciousness and simple operation, and this tractor series has sold more than 10,000 units since its release.



Minoru Tanabe, Tractor Development, Yanmar Agricultural Equipment

EF200 series tractors are the first tractors at Yanmar, designed by 3D CAD. The difficult part was the modeling and CAD handling.

The tractor has been welcomed by our customers and has experienced no serious problems so far. We are now promoting the design for the overseas specifications and variation models. We expect that the sales will top 20,000 next year



EF200 Tractor

## (b)GC695 Combine

The top model of the Yanmar Combine Top Athletes Series, the GC695, was developed with the aim of achieving the highest basic performance and functions. These were verified in the national test implemented in 2003.

The GC695, in comparison to our conventional models, achieves the same work in about 30% less time and with about 20% less fuel consumption.

The GC695, equipped with the direct injection ECO diesel engine and automatic FO injection control, reduces waste fuel consumption for high fuel economy. In addition, the barrel shaft power was reduced by about 30%, (comparison with our conventional model), at high flow volume operation through the optimum design of the threshing section, which includes a selection section with a new high-speed dual barrel and triple-fan structure. In addition, through complete weight analysis, we achieved weight reduction of about 10% (approx. 350kg). This represents about 10% reduction of both energy consumption and environmental load (CO<sub>2</sub> and SO<sub>x</sub>). With 500 combines, we can reduce energy consumption by 5.7 x 10<sup>12</sup> J, CO<sub>2</sub> by 429.5t and SO<sub>x</sub> by 344kg.

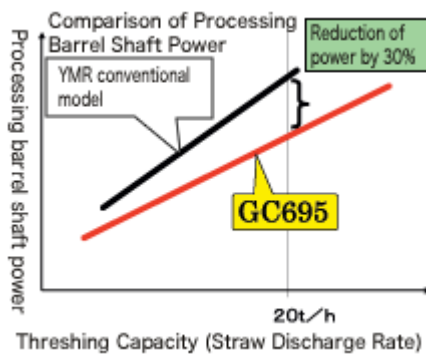


Toshinori Kiriata, Development, Seirei Industry

We promoted development of the 6-row harvest combine to be the flagship of Yanmar, with the aim of demonstrating the highest performance and efficiency in the National Certification Test. I'm delighted that the combine achieved results that were even better than expected in that test.

### <Development Concept of GC695>

- ① Best Fundamentals
- ② Uniqueness In Best Shape
- ③ Best Human Interface



Harvesting of the Combine

### (c) Ride-on Rice Transplanter (VP Series)

Energy saving and high efficiency are required for rice-transplanters in recent years. High power transmission efficiency is needed for the machine to travel over paddies on less fuel. Ease of operation is also required to achieve the high efficiency that reduces fatigue during the rice transplanting and other busy seasons. The high transmission efficiency and ease of operation have been hard to combine in the past, but are now achieved by the VP series, which features:

1. Newly developed HMT (hydraulic mechanical transmission) with both high transmission efficiency and easy HST operation.
2. Development of pedal transmission, obtaining operation speeds from bottom to the max. like in an automatic car.
  - The VP series comprises ride-on 5- and 6-row transplanting VP5, VP6, VP5C and VP6C models for use by medium-sized farm households and the ride-on 8-row transplanting VP8 and VP8D models (powered by diesel) for large farm households.
  - Advantages of High Transmission Efficiency and Easy Operation
    - 1) The max. efficiency of 93% of HMT compares with 74% of HST in conventional models. The efficiency is 1.25 times higher than with the conventional HST.
    - 2) With the gearing of pedal transmission and engine speed, the engine returns to idling during stoppages for re-loading rice seedlings, thereby realizing greater fuel economy, (VP8 and VP8D).
    - 3) Upon releasing the pedal transmission, all (traveling and transplanting) movement of the transplanter stops completely. Safety is protected even during unfamiliar jobs.
    - 4) The pedal transmission gives optional speeds and it is possible to start the machine and accelerate smoothly from zero. Seedlings are transplanted stably.



**Kensuke Omae, Development No.1,  
Yanmar Agricultural Equipment**

Once you have ridden on the VP series, you will hate to ride on any other transplanter. The VP series is so easy to use. The VP8D is equipped with a newly released diesel and the coloring is renewed. Try it for yourself!



Yanmar Rice Transplanter VP8

## 2.4 .Marine

### (a)Fishing Boat, Zarpa 23

Zarpa 23 is the lowest model of the Zarpa outdrive pleasure fishing boat series. A hard-top cabin was laid out in the middle of the deck so that you can walk around the deck freely for your fishing pleasure. The model, equipped with a 68.4kW (93hp) engine, is priced at ¥3.98 million for retail (including freight and before tax) , which is clearly competitive with the gasoline outdrive boat models which are the mainstream in this class.

Yanmar's unique hull bottom gives superior riding comfort and the boat is equipped with the multiple convenient functions and gears that are required for a pleasure fishing boat.



**Okihiro Kuroda, Boat Development, Yanmar Marine System**

Scrapping of FRP boats now represents a big problem. We develop boats with the use of materials that are easy to recycle, envisaging future scrapping.

### Environment Performance

#### ◆ Fuel Economy

In comparison to the gasoline outdrive boat, the fuel consumption of Zarpa 23 is about 40% lower. Comparing with our previous model, Top Run 24, too, Zarpa 23 expands the cruising range unit time by 2%.

#### ◆ Reduction of Air Transmission Noise

The exhaust check valve also damps noise. The air transmission noise is reduced by about 3db (A) with the use of the valve.

#### ◆ Use of Materials that are Friendly to Environment

Acrylic-based foaming material was used for the FRP core material for weight reduction and environmental considerations. This replaces wooden or PVC based foaming materials, in order to save forestry resources and prevent dioxin emissions when scrapping and recycling the boat.



Fishing boat, Zarpa 23

### (b)Fish Farming and the Development of Pharmaceutical Materials using Photosynthesis

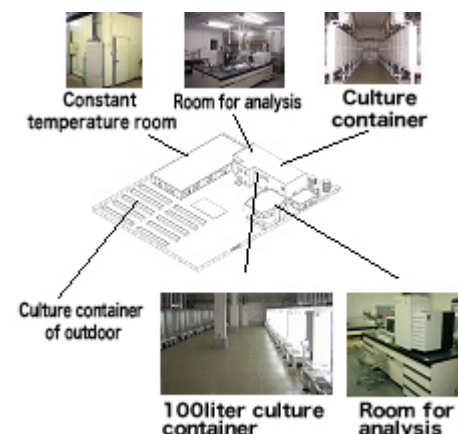
The aquatic catch of Japan peaked at 12,78 million tons in 1988, and declined to half, 6.13 million tons, in 2001. Japan's self-sufficiency rate is now 55%, reflecting also the changes in the Japanese diet. The overall food self-sufficiency rate of Japan on a calorie base is 40%. The Japanese government, based on the Fishery Organic Law, has laid down its Fishery Basic Plan that aims to raise the self-sufficiency rate during the coming 10 years. Yanmar opened Yanmar Marine Farm in 1987 at Kunisaki, Oita Prefecture and fostered photosynthetic techniques. In November 2002, Yanmar opened the Feed Laboratory Plant, too, to produce live bait with the use of the photosynthesis for supply to the bivalve lava growing facilities in various parts of Japan.

In addition, topnotch photosynthetic techniques are being researched jointly at multiple universities to develop anti-cancer materials.



**Atsumaro Masuda, Environment Plant Engineering**

I have been committed to bio-business since the establishment of the marine farm, covering all field of techniques, marketing, etc.



Major equipment of Yanmar Marine Farm



## (c) Aquatic Products Sanitation and Freshness Control System

We offer various types of equipment for aquatic product sanitation and freshness control activities currently promoted at fishing ports throughout Japan. The equipment is instrumental in raising the added value of the coastal fish catch and efficient use of the catch, which is an important resource.



**Takitaro Ozaka, Environment Plant Engineering**  
Our objective is to offer products that are useful for both the fishermen and consumers.

### 1. Clean Seawater Supply Equipment (UPF Series)

Handy Supply of Clean Seawater by a Filtration and Ultraviolet Ray Sterilization Unit: Seawater for use at the fish markets in the producing area must be sterilized appropriately for sanitation. To meet this need, Yanmar offers Clean Seawater Supply Equipment with a water treatment capacity of 10–30 tons for use at fish markets of various scales. The unit features simple installation, economy and simple operation.



Clean Seawater Supply Equipment

### 2. Cold Seawater Making Equipment

The fish catch once landed is cooled quickly by 0–2°C cold seawater, (pre-cooling), preserving freshness and saving ice consumption for cooling and preservation. The equipment makes and supplies cooled sea water.

### 3. Seawater (Flake ) Ice Making Equipment

A large quantity of ice is used to preserve the freshness of the fish catch in the processes from hauling to retail sale. The ice from Yanmar's seawater ice flake making equipment cools fish better than broken ice and, since the salt density can be controlled, fish discoloration is also minimized. The equipment saves energy since no thermal energy is to remove the ice, unlike with plate type ice making, etc. The ice-making capacity of the equipment ranges from 1 to 25 tons per day.

## 2.5. Living Environment

### (a) 20ft Cool Containers

Low energy, low pollution transshipment from trucks to railway or sea transportation is a modal shift. In Japan, when new speed controls were imposed on large trucks in September 2003, we released a new 12ft cool container with improved performance, (equipped with the CU40DG Cool Unit). In 2004, based on this new cool unit, we developed the new 20ft cool container with higher transportation efficiency.

#### Product Features

1. The new cool container allows the temperature settings from  $-20^{\circ}\text{C}$ –  $+25^{\circ}\text{C}$  with the use of a highly effective heat insulating cubicle body and door structure for such a relatively small refrigerating unit. The new container accordingly consumes less fuel.
2. The refrigerant is chlorine-free R404A(HFC), causing no damage to the ozone layer.
3. Handling and fuel supply can be performed from two places.
4. Position and temperature control can be made through a remote monitoring system.
5. Allows the installation of ozone equipment for use with deodorization, sterilization, mold-proofing and freshness preservation.
6. The container is equipped with a data logger and printer for use in checking the operational data.

### (b) Sludge Reduction Equipment

Presently, farming village waste treatment facilities are operating in more than 3,600 areas in Japan. 70% of these, however, are dependent on nearby waste treatment facilities to treat excess sludge. The sludge is ultimately is dried or burnt there for burial underground. However, the limited capacity of incineration plants, ban on discarding sludge in the ocean, etc. make sludge treatment a pressing social problem.

The sludge treatment method that is used most commonly used at present reduces sludge with compost making equipment, but in recent years there is not enough farmland to keep up. Yanmar Sludge Reduction System can reduce sludge production itself by 80%.

Public sector buyers of the Yanmar Sludge Reduction System testify that the low volume of sludge reduced by this equipment is satisfactorily returned to farmland. The mechanical treatment of the sludge uses no chemicals or bacteria and is safe for compost making.

**Yosuke Takahashi, Distribution Equipment Div.**  
I checked all minute points of the floor, wall, and ceiling of the container to prevent heat from entering and maintain the low temperature with the small refrigerating equipment. The door gasket structure was reviewed, too, to develop a new cool container with high thermal insulation. The photo shows the transportation test of the container in India. Long transportation in a temperature exceeding  $40^{\circ}\text{C}$  is common in India, but the container today carries fresh foods of high quality there



Truck transportation of 20ft cool container



**Shiro Misaki, Environment Plant Engineering**  
I will continue to propose products vigorously that can both reduce environmental load and satisfy customers' needs.



Sludge Reduction System

### (c) High Quality Compost Making Equipment

This equipment treats garbage and other food waste, cattle waste and plant cuttings as the useful biomass and converts them into high quality compost. To produce high quality compost that satisfies the needs of the farmland; this is the unique concept of Yanmar. Dual stage automatic fermentation control gets it all just right.

#### (1) Automatic Fermentation Control

Optimum fermentation control matches various raw materials by use of sensors etc.

#### (2) Multiple Compost Types

The production of multiple compost types is possible by combining the raw materials best matched to the user's needs.

#### (3) Safe Compost

The appropriate use of compost is currently being promoted for sustainable agricultural production in harmony with the environment. By mixing garbage, garden cuttings, cattle waste, etc., most of which are usually incinerated, and maturing them properly, we can help reduce global warming, recycle resources for the farmland and produce bigger crops.



**Hiroaki Muraoka, Environment Plant Engineering**  
We developed the compost making equipment in sophisticated farming, fishery and forestry research subsidized by the Ministry of Agriculture, Fishery and Forestry, using top quality technology.



High quality compost making equipment

### III. Environmental Protection Activities

#### 3.1 Medium-term Environmental Protection Plan

Yanmar implemented its first medium-term plan for the promotion of environmental activities from fiscal 1995 to 2000. The second plan is running from fiscal 2001 to 2005. The goals for fiscal 2005 are shown below.

##### Goals of the Second Medium-term Environmental Plan

Category	Sub-category	Controlled Item	Mid-term Goal
Product System	Product Cleanliness	Average NO <sub>x</sub> Emission Volume	Cut of at least 15% on average for combined annual engine production of each division
		Average CO <sub>2</sub> Emission Volume	Control of average CO <sub>2</sub> , total CO <sub>2</sub> and total NO <sub>x</sub> emission for combined annual engine production of each division
Business Operations	Energy Saving	Energy Use	Cut of energy used in production of at least 3.5% as a unit requirement of the entire company's sales turnover
		CO <sub>2</sub> Emission Volume	Cut of CO <sub>2</sub> emission during production of at least 3.5% as a unit requirement of the entire company's sales turnover
	Other Resource Saving and Recycling	Water Use	Reduction of at least 10% as a unit requirement of the entire company's sales turnover
		Waste Processing	Reduction of at least 10% as a unit requirement of the entire company's sales turnover
	Control of Dangerous Materials	Quantity Handled (total)	Reduction of at least 10% of chemicals covered by PRTR handled (used) annually by the whole company (2001 fiscal year as base)
	Pollution Prevention	Extra Provisions	With regard to legal regulations for preventing pollution, extra provisions of at least 15% for the whole company
Local Society	Local Society	Community Activities	No numerical objectives
Public Relations	Public Relations	PR Activities	No numerical objectives

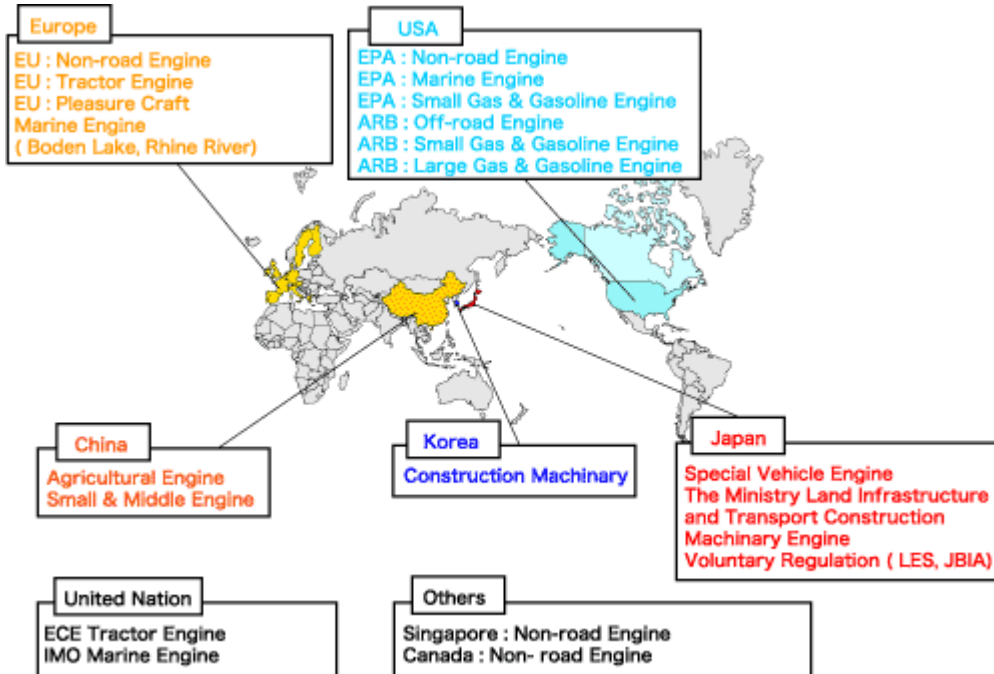
Note: Except where noted, fiscal 2000 is the base year, and 2005 the target year

## 3.2 R&D for Environmental Protection

### 3.2.1 Meeting Global Emissions Requirements

Regulatory authorities around the world have set various regulations with the purpose of cleaning the atmosphere, and the mandatory values get stricter by the year. Emissions regulation of special vehicles effectuated in Japan in 2003, and the exhaust gas emission regulation of the construction machinery already introduce in the neighboring country Korea. Similar regulation will be effected soon in China.

#### Non-road Engine Exhaust Emission Regulation around the World



### 3.2.2 Clean Exhaust Gas

Efforts are made on a continuous basis to develop the exhaust gas emissions reduction techniques needed for full compliance with the exhaust gas regulations of the world. In the field of diesel engines, in particular, this issue has been positioned as a permanent development theme. We conduct R&D on not only the improvement of engine combustion, but also electronics controls and exhaust gas after-treatment equipment to achieve extremely low exhaust emissions.



Measuring particulate matter in dilution tunnel



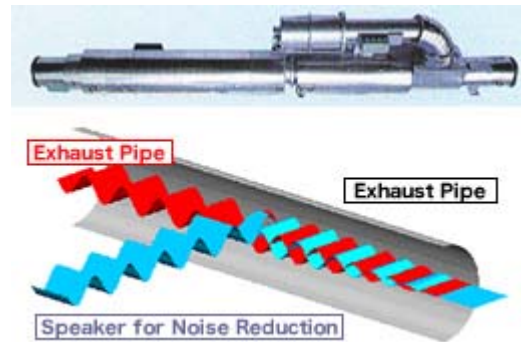
Diesel engine exh. gas measuring equipment (dilution tunnel)

### 3.2.3 Low Noise and Vibrations

The reduction of vibrations and noise emitted from engines, besides the exhaust gas prevention measures, represents an important theme for environmental improvement. At Yanmar, our own computer analyses system, VINAS, analyses engine structures and emits noise in the design stage. Appropriate modifications in subsequent stages achieve engines with low vibrations and noise. Yanmar has also developed the active noise offset system, (offsetting noise with noise) for use with marine engines.



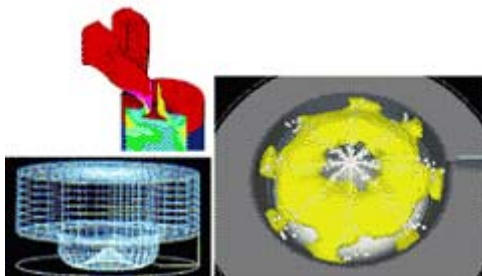
Noise level measurement in soundproof room



Active exhaust silencer for marine generator engine

### 3.2.4 Raising Fuel Economy of Engines

In order to further raise the already high thermal efficiency, which is intrinsic to diesel engines, we conduct R&D on air movement inside the cylinder, FO spraying simulation, etc. for combustion improvement, reduction of horsepower loss through the analyses of engine intake and exhaust losses, mechanical losses, etc.



Simulation analyses of combustion chamber



Performance test

### 3.2.5 Efficient Implements and Systems

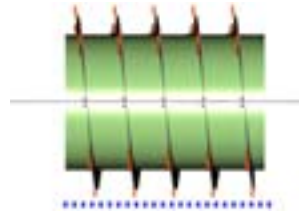
Studies are also advancing on more efficient agricultural implements, giving thought to the entire product life cycle from manufacture to use and beyond, adopting the technologies that place the lightest burden on the environment. The representative product is the Eco-Tractor, which uses an electronically governed direct injection engine and power-saving rotary. In combines, too, in order to reduce the power requirement of the threshing rotor, which comprises a large part of the required power, we promote research on the development of the energy-saving rotor that can be applied to various crop conditions. The research will contribute to the boosting of threshing capacity and speed.



Field test



PTO performance test



Multi-purpose combine rotor model

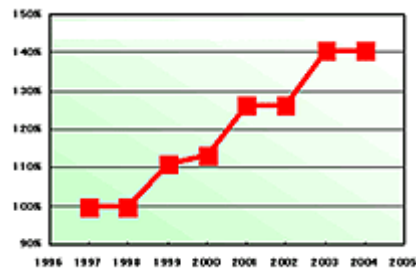


Harvesting by multi-purpose combine

The demand for energy-saving, high efficiency air conditioning systems also continues to rise and the alternative use of CFC coolant has been promoted to prevent global warming in recent years. Responding to these needs, research is advancing on coolant cycle and control technologies.



GHP FEM test



Rise of GHP energy efficiency (1997=100%)

### 3.2.6 Planning for Recycling

We weave in product characteristics as to ensure safe disassembly after the end of the service life of the product and recycling for reducing waste from early in the development stage. We envisage the machine's disassembly, recycling performance and other environmental loads. Features for ease of disassembly and recycling and environmental-friendliness are targeted in development, with clear targets for improvement in each category and for each product as a whole.



Outdoor unit



Recovery of coolant (unit turned for easy recovery)



Recovery of exterior steel

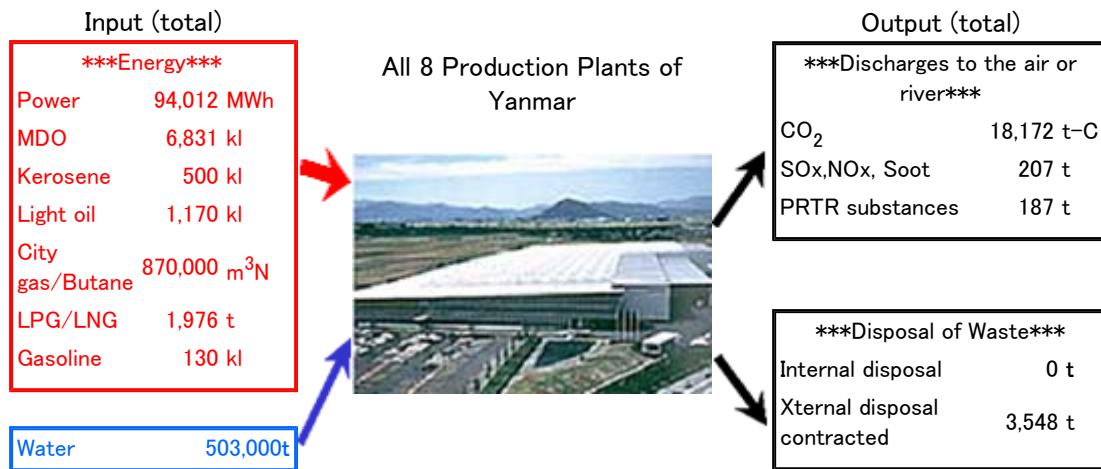


Recovery of copper pipes

### 3.3 Environmental Protection in Business Activities

#### 3.3.1 ECO Balance

Business activities necessarily produce an environmental burden in the forms of emissions of greenhouse gases and pollutants and the consumption of natural resources. Our company constantly gauges this environmental burden and endeavors to reduce it wherever possible.





### 3.3.2 Energy Saving (Preventing Global Warming)

The fuel, electric power etc. used in the course of production is being reduced in a planned manner in order to prevent global warming. In this fiscal year, too, we promoted the following items:

1. Improvement of power efficiency through inverter control of power equipment and lighting.
2. Efficiency improvement of cooling tower.
3. Improvement of energy efficiency through GHP air conditioning equipment
4. Optimum control of heating boiler by outside temperature.

In addition to the above, we introduced the regular gas cogeneration system to the Biwa Plant to curtail both energy and CO<sub>2</sub> emissions. The top photo shows a conventional water-cooled air compressor changed to inverter control compressor, enabling energy-saving operation corresponding to the air consumption.

The lower photo shows conversion from the conventional cooling tower for water used in tests to a new cooling tower with high energy saving efficiency.



Energy-saving air compressor



Change of cooling tower to supply CW water for use with test operation

The company's annual energy usage for the current fiscal year is shown in terms of crude oil. CO<sub>2</sub> emission is also described in terms of carbon conversion. Incremental and reduction ratios are in comparison to the figures for 2000.

Energy Unit Requirement and CO<sub>2</sub> Emissions Unit Requirement in 2003

	Energy unit requirement (Crude Oil kl/¥100mil.)					
	Whole Company		Shiga Zone		Amagasaki Zone	
	Unit requirement	Increase/Decrease	Unit requirement	Increase/Decrease	Unit requirement	Increase/Decrease
Fiscal 2000	32.5	—	36.4	—	24.7	—
Fiscal 2001	32.1	-1.4	36.4	0.0	24.8	0.2
Fiscal 2002	32.7	0.6	36.6	0.8	25.3	2.5
Fiscal 2003	32.8	0.9	37.4	2.8	24.4	-1.3

	CO <sub>2</sub> Emission unit requirement (t-C)/¥100mil.)					
	Whole Company		Shiga Zone		Amagasaki Zone	
	Unit requirement	Increase/Decrease	Unit requirement	Increase/Decrease	Unit requirement	Increase/Decrease
Fiscal 2000	16.6	—	18.0	—	14.0	—
Fiscal 2001	16.4	-1.7	18.0	0.1	13.6	-2.6
Fiscal 2002	16.9	1.6	18.2	1.1	14.6	4.5
Fiscal 2003	16.8	0.8	18.4	2.1	13.9	-0.5

The gross energy use and CO<sub>2</sub> emissions in 2003

	Energy consumption (Crude Oil kl)					
	Whole Company		Shiga Zone		Amagasaki Zone	
	Unit requirement	Increase/Decrease	Unit requirement	Increase/Decrease	Unit requirement	Increase/Decrease
Fiscal 2000	38,926	—	29,160	—	9,766	—
Fiscal 2001	32,641	-16.1	23,302	-20.1	9,339	-4.4
Fiscal 2002	35,189	-9.6	25,686	-11.9	9,503	-2.7
Fiscal 2003	35,542	-8.7	26,244	-10.0	9,298	-4.8

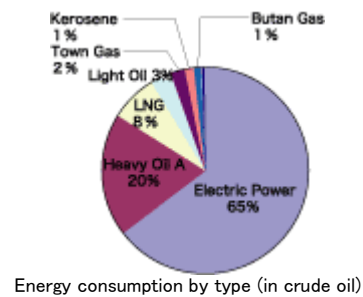
	CO <sub>2</sub> Emission t-C					
	Whole Company		Shiga Zone		AmagasakiZone	
	Energy use	Increase/ Decrease	Energy use	Increase/ Decrease	Energy use	Increase/ Decrease
Fiscal 2000	19,298	—	14,417	—	5,511	—
Fiscal 2001	16,657	-16.4	11,533	-20.0	5,124	-7.0
Fiscal 2002	18,206	-8.6	12,737	-11.7	5,469	-0.8
Fiscal 2003	18,172	-8.8	12,882	-10.6	5,290	-4.0

At the Shiga Zone, the energy consumption fell from the base year (2000), but is now increasing. The same tendency applies to the unit requirement, which has slightly worsened from the level of the base year.

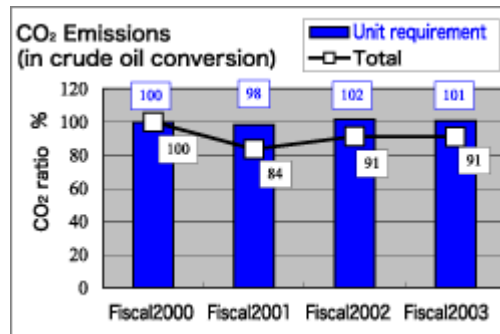
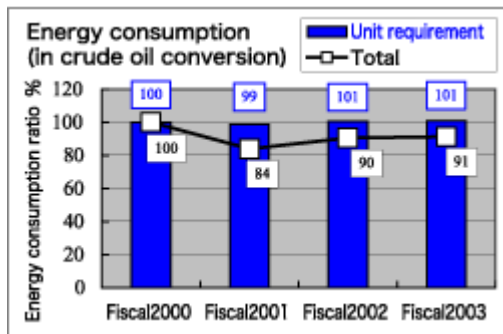
At the Amagasaki Division, the energy consumption has fallen from the base year and the unit requirement has also improved, reflecting the improved production efficiency of the Tsukaguchi Plant, where the production of marine engines has been concentrated.

The energy used by our company breaks down into energy type as shown in the diagram at the right. The electric power consumption comprises the largest part. It is apparent that we must attach importance to reduced energy consumption.

The consumption of heavy oil (JIS A) was second. The major use was air conditioning of the plants. The consumption of LNG increased due to the introduction of a gas co-generation system to Biwa Plant.



The changes in energy consumption and CO<sub>2</sub> emissions with the base year (2000) as 100% are shown in the diagrams below:



The changes of energy consumption shows that the consumption is on the steady increase excepting 2001, when the consumption declined temporarily. The same tendency applies to the unit requirement, which has worsened slightly from the base year (2000). This worsening energy efficiency reflects the temporary drop of operation rates of several plant after the transfer of production equipment, in accordance with the re-organization of the production system.

The tendency of CO<sub>2</sub> emissions shows the same tendency as energy consumption. However, the CO<sub>2</sub> emission unit requirement in 2003 improved slightly, reflecting the effect of the improvement implemented at the Amagasaki Division.

In the future, we will further improve the gas co-generation system introduced to Biwa Plant for raising energy efficiency. We will introduce a gas cogeneration system to the Amagasaki Division, too, for switching to city gas, which has low CO<sub>2</sub> emissions characteristics.

## Topics

### Co-generation System Introduced to Biwa Plant

The Biwa Plant is the principal plant to produce small and medium engines. The gas engine co-generation system was introduced to the plant and started regular operation in April 2003.

The co-generation system consists of a gas engine power generation unit run by liquefied natural gas (LNG) and the exhaust gas boiler. The total power generation output is 1,750kW, (350kW x 5 units), which can supply 35% of the annual power requirement of the plant. In addition, the heat recovered by the exhaust gas boiler is used for the air conditioning of the plant and also for the engine's painting line.

The liquefied petroleum gas (LPG) for use with the GHP and kitchen equipment in the administration ward was changed to LNG. The steam boiler operated on kerosene also switched fuel to LNG.

Thanks to these efforts, the energy consumption decreased by 22%(in crude oil conversion), and CO<sub>2</sub> emissions curtailed by 1.8%, when compared to the consumption before the introduction of the cogeneration system.



Overall view of gas cogeneration facility

### 3.3.3 .Resource Saving and Re-cycling (Waste Reduction)

The water consumption and waste production of our company for the current year are shown below. The rate of increment/decrease is to the base year (2000).

Unit Requirement for Water Consumption and Waste Production in 2003

	Unit Requirement of Water Consumption(ton/¥100 million)					
	All company		Shiga Div.		Amagasaki Div.	
	Unit requirement	Increase / Decrease	Unit requirement	Increase / Decrease	Unit requirement	Increase / Decrease
Fiscal 2000	586.3	—	311.2	—	993.2	—
Fiscal 2001	559.4	4.3	281.3	-9.6	1032.2	3.9
Fiscal 2002	527.3	-1.7	253.2	-18.6	1039.5	4.7
Fiscal 2003	464.4	-16.4	290.9	-14.5	784.1	-21.1

	Unit Requirement of Waste (ton/¥100 million)					
	All company		Shiga Div.		Amagasaki Div.	
	Unit requirement	Increase / Decrease	Unit requirement	Increase / Decrease	Unit requirement	Increase / Decrease
Fiscal 2000	3.22	—	4.10	—	1.43	—
Fiscal 2001	3.37	4.8	4.54	10.9	1.37	-4.0
Fiscal 2002	2.86	-11.1	3.76	-9.4	1.17	-17.7
Fiscal 2003	3.38	1.9	4.25	3.8	1.48	3.5

The total water consumption and waste volumes in 2003

	Water Consumption (ton)					
	All company		Shiga Div.		Amagasaki Div.	
	Consumption	Increase / Decrease	Consumption	Increase / Decrease	Consumption	Increase / Decrease
Fiscal 2000	641,918	—	249,596	—	392,322	—
Fiscal 2001	569,451	-11.3	180,294	-27.8	389,157	-0.8
Fiscal 2002	567,336	-11.6	177,508	-28.9	389,828	-0.6
Fiscal 2003	502,962	-21.6	204,203	-18.2	298,759	-23.8

	Production of Waste (ton)					
	All company		Shiga Div.		Amagasaki Div.	
	Unit requirement	Increase / Decrease	Unit requirement	Increase / Decrease	Unit requirement	Increase / Decrease
Fiscal 2000	3,849	—	3,286	—	563	—
Fiscal 2001	3,429	-10.9	2,913	-11.4	516	-8.3
Fiscal 2002	3,042	-20.1	2,602	-20.8	440	-21.9
Fiscal 2003	3,547	-7.8	2,985	-9.2	562	-0.2

## (1) Water Consumption

The water consumption of the company has been reduced steadily and this fiscal year, too, we were successful in reducing the consumption by 11.3% or by 64,000 tons from the consumption in the previous year. Although the water consumption in the Shiga Div. increased, that in the Amagasaki Div. decreased largely. In the whole company, we achieved a large reduction of 503,000 tons from the level of the previous years.

The increase of water consumption in the Shiga Div. is attributable to the breakage of the underground water supply pipe, and evaporation losses of cooling water associated with the new introduction of the cogeneration system. The break in the underground pipe has already been repaired.

In the Amagasaki Div., water consumption was reduced largely by cooling of the cooling water for use with the engine cooling water pit in the cooling tower in advance.



CW Pit & Cooling Tower of Amagasaki Plant  
In order to maintain the temperature of the CW pit below 30°C, industrial water was fed into the pit in the past. This feeding of industrial water was much reduced by cooling in the cooling tower.



Blower



Oil film recovery equipment

When reducing the industrial water fed to the CW pit, the water quality is worsened. To avoid this degeneration, the oil film that floats on the water surface is blown to the recovery equipment for efficient recovery of oil content. This is instrumental in maintaining the water quality and reducing the industrial water feed.

## (2) Waste

The production of waste has been on the decrease, but waste production this year in both Divisions increased by 472 tons (15%) from 3075 to 3547 tons.

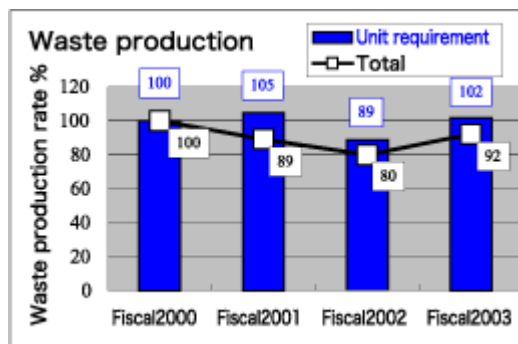
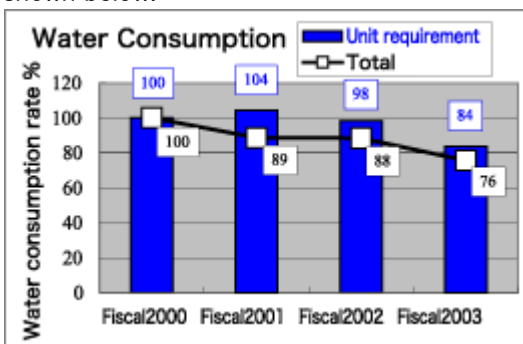
In the Shiga Division, waste increased due to the increase of waste water, etc. which was treated as waste due to insufficient capacity in the captive waste treatment facility and the increase of waste packing materials procured overseas. In January 2004, the capacity of the waste water treatment facility was raised for the captive treatment of waste water. Concerning waste packing materials, we aim to reduce waste through waste reduction and recycling programs.

The increase of waste production in the Amagasaki Division reflects the increase of parts deliveries and waste packing materials associated with the concentrated production of marine engines at the Tsukaguchi Plant. We plan to reduce waste by using the same containers for parts deliveries and repeated use of pallets.



Waste treatment facility of Biwa Plant, (new Nitrogen Removal Equipment, right)

Changes of water consumption and production of waste with the base year as 100% are shown below:



The water consumption of our company has been reduced steadily and the reduction was especially large in 2003. In view of the unit requirement, too, it was reduced to 83.6%.

The production of waste increased in the current fiscal year. The unit requirement, too, worsened from the level of the base year, (2000). Since the factors behind this aggravation have already been identified, we will concentrate on reducing waste in 2004.

The production of waste in 2003 was 3,548 tons and the final treatment volume was 330 tons. We will continue to reduce waste production and final treatment volume.

## (3) Cutting Oil for Machining

At the Tsukaguchi Plant, we added oil/water separators for use with the machining cutting oil. By separating and collecting the lube oil content mixed in the cutting oil, the service life of the cutting oil was successfully extended and the consumption reduced.



Floating oil/water separator added.

### 3.3.4 Environment Risk Management (Control of Dangerous Materials)

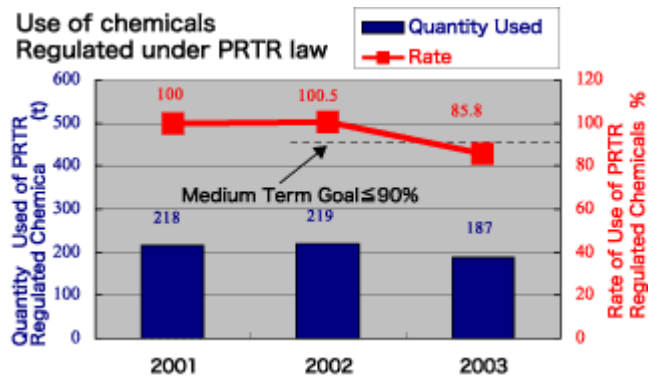
All chemical materials used in the factories are checked and controlled in accordance with the PRTR Law, as shown below by quantity used, discharge to the environment, disposal, use for the products, etc.

#### Consumption of Chemicals Covered by the PRTR Law

(Results for fiscal 2003) Use reported to the agency highlighted. Unit: kg

No.	Names of Chemicals / Site	Reg. No.	Biwa	Yamamoto	Nagahama	Omori	Nagahara	Kinomoto	Amagasaki	Tsukaguchi	Total
1	Zinc	1	0	0	0	9	17	1,440	0	0	1,465
2	2-aminoethanol	16	149	288	686	4	0	0	0	0	1,127
3	Straight chain alkyl Benzenesulfonic acid & its salt	24	0	0	0	1	0	0	0	0	1
4	Bisphenol A Epoxy resins	30	0	4	2	0	0	0	0	0	6
5	Ethyl benzene	40	10,543	393	3,101	3	3	5,772	369	731	20,914
6	Xylene	43	0	0	0	0	0	10,365	0	0	10,365
7	Sesivalent chrome	63	55,713	1,899	5,450	34	97	8,415	9,436	2,544	83,588
8	Ethylene glycol	69	0	0	6	0	0	27	41	43	117
9	Ethylene glycol Monoethylacetate	101							0	668	668
10	Tin	176	0	0	0	0	0	92	0	0	92
11	1,3, 5-trimethylbenzene	224	704	5	209	3	55	332	166	183	1,658
12	Toluene	227	33,152	3,455	4,158	37	8	9,284	7,849	6,780	64,723
13	Lead	230	0	0	0	0	0	126	166	14	307
14	Nickel	231	0	0	0	0	0	18	0	0	18
15	Nickel compounds	232	0	0	0	0	0	128	0	0	128
16	Hydrazine	253	0	0	0	0	36	91	0	0	127
17	Phthalic acid di-N-butyl	270	111	8	2	2	1	1	0	0	123
18	Phthalic acid di-2-ethylhexyl	272	1	0	0	0	0	0	0	0	2
19	Fluoridation hydrogen & its water soluble salt	283	0	68	0	0	0	0	0	0	68
20	Benzene	299	23	175	240	1	0	0	0	0	439
21	Polyoxyethylene=alkylphenylether	307	145	0	137	0	116	0	0	0	397
22	Polyoxyethylene=nonylphenylether	309	0	0	0	81	226	209	0	0	515
23	Manganese	311	0	0	0	0	0	192	0	0	192
24	Molybdenum & its compounds	346	3	2	2	0	0	0	0	0	8
Total			100,544	6,297	13,994	173	558	36,490	18,027	10,963	187,047

The annual consumption of chemicals regulated under the PRTR Regulation is listed above. Details of the uses of chemicals exceeding the regulated level are reported to the agencies of the national or local governments in accordance with their regulations. Changes of the PRTR chemicals consumption are shown at the right. As a result of promoting the reduction of ethylene glycol and organic solvent, we have been successful in reducing the use of such chemicals by 32 tons. The consumption of the chemicals was reduced by 14.2% to the level of PRTR base year, (2001), already achieving the medium term goal of reduction by 10%. We will promote lower use of PRTR regulated chemicals through rationalization of the uses of the chemicals, introduction of non-polluting alternatives, etc.



## Group Companies: Consumption of Chemicals Covered by the PRTR Law

(Results for fiscal 2003) Use reported to the agency highlighted.

Unit:kg

No.	Names of Chemicals Class 1 Designated	Reg. No.	Seirei	Kanzaki	New Delta	Matsue Diesel	Koga Foundry	Yanmar Farm Machinery	Yanmar Energy System	Tsukaguchi	Total
1	Zinc water soluble compounds	1	2,991	0	0	0	0	0	0	0	2,991
2	2-aminoethanol	16	5	0	0	0	0	0	0	0	5
3	Antimony	25	0	0	0	0	2,020	0	0	0	2,020
4	Bisphenol A Epoxy resins	30	608	0	0	0	0	0	0	0	608
5	Ethyl benzene	40	28,362	119	0	465	0	1,627	0	0	30,753
6	Ethylene glycol	43	8,740	0	0	0	0	6,495	60,873	0	76,108
7	Epsiloncaprolactam	61	113	0	0	0	0	0	0	0	113
8	Xylene	63	184,115	1,956	0	809	0	7,892	0	0	194,772
9	Chrome and triad chrome compounds	68	0	0	0	196,254	36,400	0	0	0	232,654
10	Hexadchrome compounds	69	3,045	0	0	0	0	0	0	0	3,045
11	Ethylene glycol Monoethylacetate	101	0	0	0	1	0	0	0	0	1
12	Dichloromethane (ethylene dichloride)	145	0	0	0	0	0	69	0	0	69
13	Organic tin compounds	176	288	0	0	0	0	0	0	0	288
14	Styrene	177	0	0	0	0	0	0	0	194,502	194,502
15	1,3, 5-trimethylbenzene	224	2,981	0	0	53	0	704	0	0	3,738
16	Toluene	227	35,027	8,134	5,342	1,701	0	17,198	0	0	67,402
17	Lead and lead compounds	230	850	0	0	113	0	0	0	0	963
18	Nickel compounds	231	0	0	0	0	304	0	0	0	304
19	Nickel compounds (Nickel nitrate II hexahydrate)	232	54	0	0	0	0	0	0	0	54
20	Barium	243	0	0	0	0	2,961	0	0	0	2,961
21	Phenol	266	0	0	0	8,212	512	0	0	0	8,724
22	Phthalic acid di-N-butyl	270	13	0	0	0	0	0	0	0	13
23	Benzene	299	0	0	0	0	0	351	0	0	351
24	Polyoxyethylene=alkylphenylether	307	201	0	0	0	0	0	0	0	201
25	Polyoxyethylene=nonylphenylether	309	198	0	0	0	0	288	0	0	486
26	Formaldehyde	310	96	0	0	0	0	0	0	0	96
27	Manganese and manganese compounds	311	2,967	0	0	31,859	36,477	0	0	0	71,303
28	Molybdenum & its compounds	346	35	0	0	0	1,302	0	0	0	1,337
Total			270,688	10,209	5,342	239,467	79,976	34,624	60,873	194,502	895,681

## Supervision of PCBs

Each plant controls and stores condensers etc. that include PCBs with great strictness and reports their status each year to their respective prefectural governor. The PCB-related laws shall continue to be observed and the control and processing of PCBs enhanced. Equipment containing PCB is stored at each site as follows:

Div.	Shiga Div.	Large Eng. Factory	Marine Factory	Technical Institute	Head Office	otal
PCB equipment	739	322	1	0	0	1062

No. of PCB equipment of Yanmar group companies are stored as follows:

Div.	Seirei	Kanzaki	Matsue Diesel	Koga Foundry	Yanmar Energy System	New Delta	Yanmar Agricultural Machinery mfg
PCB equipment	24	5	2	23	89	1	2

Yanmar group as a whole owns and stores 1208 PCB comprising equipment, which will be detoxified systematically in the coming few years.



### 3.3.5 Site Data (Preserving the Community Environment)

The environment preservation data of our major plants are shown on the following pages. We continue to control the public nuisance under voluntary standards stricter than those of the environmental regulations and ordinances. The measurement results are represented by the trend diagrams, which are used for grasping the operation rate of the facility and preventing trouble. There were no violations of environment related laws, but some sites exceeded the voluntary standard, (highlighted.) Countermeasures are specified for items that exceed the voluntary standards.

#### Small Engine Factory, Biwa

Name of Plant: Biwa Plant

Major Production Item: Vertical Water-cooled Medium and Small Engines; Gas engines

Location: Kawamichi 1009-2, Biwa-cho Higashi Azai-gun, Shiga Prefecture Tel. 0749-72-5151



#### 1.Business Activities

Vertical water-cooled diesel engines for use with a wide range of agricultural machinery, construction machinery and other general industrial equipment are produced under an integrated system from machining, assembly, test operation through to coating and shipping. Gas engines are also assembled at the plant.

#### 2.Environmental Preservation Activities

- 1.Environmental load reduction from compressors,(prevention of air leakage)
- 2.Raising co-generation efficiency
- 3.Energy-saving through raising production efficiency,(control on power, fuel and gas consumption)
- 4.Oil purification for longer service life ; prevention of cutting oil leakage and splashing.
- 5.Check of tap water leakage by batch meter.
- 6.Gathering machining metal chips for recycling.
- 7.Reduction of environmental load of products, (low fuel consumption, energy saving and exhaust gas purification)

#### 3.Environmental Data

(1)Water Quality (Water discharged to the sewerage )

Div.	Unit	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	5~9	5.4~8	7.7	6.7	7.3
	BOD	600	480	310.0	1.9	56.9
	SS	600	480	95.0	3.5	29.0
	Oil content	5	4	1.3	0.5	0.6
	T-N	60	48	55	13.3	32.4
	T-P	10	8	2.35	0.06	0.53

(2)Air Quality (Max. Value)

1.Boiler (Fuel: Kerosene)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	Not regulated.		(62)
Sulfuric oxides	Nm <sup>3</sup> /h	4.65	2.79	0.01
Soot particles	g/Nm <sup>3</sup>	Not regulated.		(0.001)

2.Boiler (Fuel: LNG)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	150	90	93
Sulfuric oxides	Nm <sup>3</sup> /h	7.35~8.09	4.40~4.90	0.01
Soot particles	g/Nm <sup>3</sup>	0.10	0.06	0.001

3.Co-Gen(Fuel:LNG)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	600	360	110
Sulfuric oxides	Nm <sup>3</sup> /h	0.65	0.40	0.01
Soot particles	g/Nm <sup>3</sup>	0.05	0.03	0.010

(3)Noise (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Morning	DB(A)	65	63	55
Day time		70	68	68
Evening		70	68	68
Night		60	58	54

: A value that satisfied the legal stipulation, but exceeded our voluntary standard. Water discharged to sewerage: We conducted engineering to raise the waste water treatment capacity , which was inaugurated from July 2004. Boiler: standard operation is promoted.

## Small Engine Factory, Yamamoto

Name of Plant: Yamamoto Plant  
 Major Production Item: Air-cooled gasoline engines,  
 Location: Yamotomoto 3198, Kita-machi, Higashi Azai-gun,  
 Shiga Prefecture  
 Tel. 0749-79-0305



### 1. Business Activities

Aluminum alloy parts are indispensable for engine weight reduction. The aluminum parts are cast and machined here. Air-cooled gasoline engines, horizontal water-cooled / vertical air-cooled diesel engines are also produced by an integrated system of assembly, operation and shipping.

### 2. Environmental Preservation Activities

1. Environmental load reduction from compressors, (prevention of air leakage).
2. Energy-saving measures for the heaters and furnace burners.
3. Promotion of inverter control of motive power
4. Installation of energy-saving nozzles to heaters.
5. Oil purification for service life extension and standard replacement of oils and greases.
6. Solidification and recycling of polishing waste powder.
7. Reduction of environment loads of products, (low fuel consumption, energy-saving, purification of exhaust gas, etc.)

### 3. Environmental Data

(1) Water Quality (Water discharged to the river)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	6.0~8.5	6.2~8.2	7.4	6.3	7.0
	BOD	30.0	24.0	16.0	0.6	3.4
	COD	30.0	24.0	21.0	0.5	5.7
	SS	70.0	56.0	19.0	1.0	2.4
	Oil content	5.0	4.0	0.8	0.5	0.5
	T-N	12.0	9.6	0.96	0.52	0.64
	T-P	1.2	0.96	0.11	0.02	0.04

(2) Air Quality (Max. Value)

Metal Melting Furnace (Fuel: Heavy Fuel Oil)

Div	Measured Item	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	180	108	63
Sulfuric oxides	Nm <sup>3</sup> /h	0.61	0.37	0.02
Soot particles	g/Nm <sup>3</sup>	0.2	0.12	0.003

(3) Noise (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Morning	dB(A)	60	58	56
Day time		65	63	57
Evening		65	63	56
Night		55	53	54

: A value that satisfied the legal stipulation, but exceeded our voluntary standard. We try not to open plant doors often so that noise inside the plant will not escape outdoors.

## Small Engine Factory, Nagahama

Name of Plant: Nagahama Plant  
 Major Production Item: Horizontal Water-cooled / Vertical Air-cooled / Vertical Water-cooled Diesel Engines ; Diesel outboard motors, Saildrive units, Metal molds  
 Location: Sanwa-cho 7-35, Nagahama, Shiga Prefecture Tel. 0749-65-3008



### 1. Business Activities

Design and assembly of horizontal water-cooled / vertical air-cooled / vertical water-cooled diesel engines for use with a wide range of agricultural machinery, construction machinery and other general industrial equipment; development of diesel outboard motors; design and production of aluminum die cast molds; operation of gas engine and saildrive units. Production is conducted under an integrated system handling everything from machining, assembly and test operation through to coating and shipping.

### 2. Environmental Preservation Activities

1. Environmental load reduction from compressors, (prevention of air leakage).
2. Efficient boiler operation (geared with outdoor and room temperatures)
3. Extending service life of cutting oil through density control and purification; standard replacement of oils and greases.
4. Reduction of paper consumption
5. Reduction of environmental load of products, (low fuel consumption, energy saving and exhaust gas purification)
6. Solidification and recycling of polishing powder.

### 3. Environmental Data

#### (1) Water Quality (Water drained to sewerage)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	5~9	5.4~8.6	7.4	6.3	7.0
	BOD	600	480	34.0	0.6	7.8
	SS	600	480	10.0	1.0	4.3
	Oil content	5	4	0.8	0.5	0.5
	T-N	60	48	53.6	5.2	21.6
	T-P	10	8	0.76	0.02	0.26

#### (2) Water Quality (Discharged to river)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	6.0~8.5	6.2~8.2	8.2	7.2	7.8
	BOD	20.0	4.0	5.5	0.5	1.7
	COD	20.0	16.0	8.3	0.5	2.3
	SS	70.0	4.0	13.0	1.0	1.7
	Oil content	5.0	4.0	0.5	0.5	0.5
	T-N	8.0	6.4	2.99	0.38	0.90
	T-P	0.8	0.64	0.19	0.04	0.11

#### (3) Air Quality (Max. Value)

Boiler (Fuel: Heavy Fuel Oil)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	180~250	108~150	130
Sulfuric oxides	Nm <sup>3</sup> /h	3.68~5.08	2.21~3.05	0.18
Soot particles	g/Nm <sup>3</sup>	0.24	0.14	0.002

#### (4) Noise (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Morning	dB(A)	60	58	55
Day time		65	63	60
Evening		65	63	52
Night		55	53	50

: A value that satisfied the legal stipulation, but exceeded our voluntary standard. Water drained to sewerage: Operation of the treatment facility is being improved. Water discharged to river: plant roads, side ditches, etc. cleaned for maintaining water quality.

## Small Engine Factory, Kinomoto

Name of Plant: Kinomoto Plant  
 Major Production Item: Tractors and golf carts  
 Location: Kuroda 650, Kinomoto-cho, Ika-gun, Shiga  
 Prefecture  
 Tel. 0749-82-3322



### 1. Business Activities

- (1) Machining of crankshafts and cylinder heads for use with the diesel engines produced at the Biwa Plant. The tractors equipped with the diesel engines produced at the Biwa Plant, contribute much to the energy saving of agricultural work.
- (2) Tractor parts by an integrated system handling everything from machining, press, welding, resin molding, coating, assembly and test operation through to packing and shipping. The golf carts, (4~5 passengers, self driving electro-magnetic guided type) are also produced here under the same integrated system.

### 2. Environmental Preservation Activities

- 1.Environmental load reduction from compressors, (prevention of air leakage, improvement).
- 2.Efficient boiler operation (geared with outdoors and room temperatures)
- 3.Reduction of starting time of drying furnace.
- 4.Purification of oil for longer service life and establishment of oil and grease replacement standard.
- 5.Reduction of sludge; reduction of packing materials, (corrugated corrugate cardboards, plastics, etc.)
- 6.Reduction of paper scraps
- 7.Solidification and recycling of polishing waste powder.

### 3. Environmental Data

#### (1) Water Quality (Drained to sewage)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	5~9	5.4~8	7.4	6.5	6.9
	BOD	600	480	250	1.1	12
	SS	600	480	14	0.5	3.9
	Oil content	5	4	1.5	0.5	0.6
	T-N	60	48	3.9	1.3	2.5
	T-P	10	8	0.71	0.03	0.17

#### (2) Water Quality (Water discharged to the river)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	6.0~8.5	6.2~8.2	8.0	6.5	7.2
	BOD	30.0	24.0	4.6	0.5	1.5
	COD	30.0	24.0	5.1	0.5	1.6
	SS	70.0	56.0	25.0	1.0	2.5
	Oil content	5.0	4.0	0.8	0.5	0.5
	T-N	12.0	9.6	1.18	0.66	0.92
	T-P	1.2	0.96	0.18	0.01	0.06

#### (3) Air Quality (Max. Value)

##### 1. Boiler (Fuel: Heavy Fuel Oil)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	180~250	108~150	97
Sulfuric oxides	Nm <sup>3</sup> /h	1.16~8.13	0.70~4.88	0.09
Soot particles	g/Nm <sup>3</sup>	0.3	0.18	0.0

##### 2. Drying Furnace (Fuel: Butane gas)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	230	138	97
Sulfuric oxides	Nm <sup>3</sup> /h	1.23~1.79	0.74~1.07	0.1
Soot particles	g/Nm <sup>3</sup>	0.2	0.12	0.001

#### (4) Noise (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Morning	dB(A)	65	63	56
Day time		70	68	62
Evening		70	68	57
Night		60	58	55

## Precision Machinery Factory, Omori

Name of Plant: Omori Plant  
 Major Production Item: Fuel Injection Pump  
 Location: Shigenori 354, Takatsuki-cho, Ika-gun, Shiga  
 Prefecture  
 Tel. 0749-85-3000



### 1.Business Activities

The fuel injection equipment is the core part for the diesel engine. The fuel injection equipment is produced by an integrated system from machining, assembly and test operation to shipping.

### 2.Environmental Preservation Activities

- 1.Environmental load reduction from compressors, (prevention of air leakage).
- 2.Promotion of inverter controls on power and lighting
- 3.Additional installation of door opening/closing equipment and air curtain
- 4.Extension of service life by oil purification and recovery of oil used for machining
- 5.Solidification and recycling of waste polishing powder
- 6.Reduction of packing material waste by improving packing methods (abolishing the use of corrugated cardboards)

### 3.Environmental Data

(1)Water Quality (Water discharged to the river)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	6.0~8.5	6.2~8.2	7.3	6.8	7.1
	BOD	30.0	24.0	20.0	2.1	8.2
	COD	30.0	24.0	25.0	2.0	9.5
	SS	30.0	24.0	6.4	0.8	2.0
	Oil content	70.0	56.0	0.5	0.5	0.5
	T-N	12.0	9.6	5.22	1.36	2.37
	T-P	1.2	0.96	0.11	0.02	0.05

(2)Noise (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Morning	dB(A)	50	48	43.4
Day time		55	53	46.4
Evening		50	48	46.3
Night		45	43	42.8

(3)Air Quality (Max. Value)

[The plant does not have applicable air polluting facilities]

: A value that satisfied the legal stipulation, but exceeded our voluntary standard. Cleaning of waste water sources and improved operation of the treatment facility are promoted.

## Precision Machinery Factory, Nagahara

Name of Plant: Nagahara Plant  
 Major Production Item: Fuel oil injection nozzles  
 Location: Sho 18, Nishi-azai-machi, Ika-gun, Shiga  
 Prefecture  
 Tel. 0749-89-1151



### 1. Business Activities

The fuel injection nozzle is a core part for diesel engines. The fuel oil injection nozzles are produced under an integrated system of machining, assembly, operation and shipping.

### 2. Environmental Preservation Activities

1. Inverter control of equipment power.
2. Energy-conservation through decentralized air conditioning piping and use of open/close valves
3. LPG consumption reduction by improving the nitrating treatment.
4. Oil and grease consumption reduction by purification and recycling
5. Reduction of packing material waste by improving packing methods
6. Solidification and recycling of polishing waste powder.

### 3. Environmental Data

#### (1) Water Quality (Water discharged to the river)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	6.0~8.5	6.2~8.2	7.6	7.1	7.3
	BOD	40.0	32.0	13.0	0.5	3.2
	COD	40.0	32.0	14.0	0.5	3.4
	SS	90.0	72.0	9.2	1.0	1.5
	Oil content	5.0	4.0	2.0	0.5	0.6
	T-N	15.0	12.0	1.46	0.57	0.95
	T-P	1.5	1.2	0.08	0.01	0.04

#### (2) Air Quality (Max. Value)

Boiler (Fuel: Heavy Fuel Oil)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	(not regulated)		(110)
Sulfuric oxides	Nm <sup>3</sup> /h	7.62	4.57	0.03
Soot particles	g/Nm <sup>3</sup>	(not regulated)		(0.008)

#### (3) Noise (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Morning	dB(A)	60	58	51
Day time		65	63	53
Evening		65	63	53
Night		55	53	49.5

## Large Engine Factory, Amagasaki

Name of Plant: Amagasaki Plant  
 Major Production Item: Large engines and Gas turbines  
 Location: 1-1, Nagasu Higashi-dori 1-Chome, Amagasaki  
 Tel.06-6489-8005



### 1.Business Activities

The plant specializes in the production of large diesel engines. Besides the marine main and auxiliary engines, industrial diesel engines, gas engines and gas turbines are produced under an integrated production system.

### 2.Environmental Preservation Activities

The plant promotes the ideal of harmonizing corporate progress with both local and global environmental preservation. Its aim to achieve this through daily activity for environmental preservation in the following fields:

- 1.Beautifying plant appearance; use of meshed fences, expansion of greenery; harmony with local community
- 2.Introduction of cogeneration system and (inverter) energy-saving equipment for energy-saving
- 3.Electric air conditioners switched to equipment operated on city gas for energy saving.
- 4.Air conditioner fuel switched from heavy fuel oil to city gas to prevent air pollution.
- 5.Re-cycling of overflow water of test operation load equipment; switch of the load equipment to the dry type for reducing water consumption
- 6.Promotion of recycling/purification of cutting and cleaning oils for machining and assembly lines; reduction of industrial wastes, cutting & cleaning oils and water consumption.
- 7.Recycling and reduction of industrial wastes, (plastic containers)
- 8.Extension of service life of pallet by change of material, (wooden a plastics) for reduction of wastes
- 9.Recycling of used paper, fluorescent lamps, mercury lamps for reduction of wastes
- 10.Reduction of the use of toxic materials for products (engine and gas turbine); promotion of Green procurement; compliance with PRTR regulation

### 3.Environmental Data

#### (1)Water Quality (waste water to drainage)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	Temp.	Below 40°C	Below 30°C	30	18	25
	PH	5.7~8.7	6.2~8.2	7.2	6.9	7.02
	Oil content	35	10	1.75	1.00	1.21
	SS	300	10	5.50	1.25	2.47

#### (2)Air Quality (Max. Value)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	150~250	75~200	34~72
Sulfuric oxides	Nm <sup>3</sup> /h	2.2	2	1.44
Soot particles	g/Nm <sup>3</sup>	0.05~0.30	0.03~0.08	0.001~0.010

#### (3)Noise (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Morning	dB(A)	70	67	57
Day time		70	67	67
Evening		70	67	57
Night		60	57	57

#### (4)Vibrations (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Day time	dB(A)	65	62	52
Night		60	57	40

## Marine Factory, Tsukaguchi

(The Tsukaguchi Plant was re-organized as a new marine engine plant effective from July 2003. )

Name of Plant: Tsukaguchi Plant

Major Production Item: Medium diesel engines

Location: 3-1, Tsukaguchi Honcho 5-chome, Amagasaki

Tel. 06-6428-3122



### 1. Business Activities

The plant promotes the ideal of harmonizing corporate progress with both local and global environmental preservation. Its aim to achieve this through daily activity for environmental preservation in the following fields:

### 2. Environmental Preservation Activities

Beautifying plant appearance; use of meshed fences, expansion of greenery; harmony with local community

1. Beautifying plant appearance; use of meshed fences, expansion of greenery; harmony with local community
2. Air conditioner fuel switched from heavy fuel oil to city gas to prevent air pollution.
3. Reduction of engine exhaust noise (with silencer installation) to prevent noise and public nuisance
4. Energy-saving equipment for air conditioners introduced.
5. Oil/water separation equipment for machining oil introduced to prevent waste water emulsification.
6. Improvement of oil/water separation tank for test operation cooling water, etc. to prevent waste water emulsification.
7. Simplifying and recycling of delivery/shipping packing materials for reducing wastes
8. Reduction of the use of toxic materials for products for environmental protection.
9. Green procurement, recycling of paper, water, wooden chips, etc.

### 3. Environmental Data

#### (1) Water Quality (waste water to drainage)

Div.	Measured Item	Standard value	Voluntary value	Measured Value		
				Max	Min	Average
Density Unit (mg/liter)	PH	5.7~8.7	5.9~8.5	8.49	7.3	8.3
	BOD	300	200	9.7	1.2	3.22
	SS	300	200	18	1	2.68
	Oil content	35.0	4.5	4.1	1	1.02
	Temp.	40°C	30°C	29	10.5	15.5

#### (2) Air Quality (Max. Value)

Div	Unit	Standard value	Voluntary value	Measured Value
Nitrous oxides	ppm	180~250	75~100	31~70
Sulfuric oxides	Nm <sup>3</sup> /h	0.09~0.33	0.02~0.05	0.005~0.034
Soot particles	g/Nm <sup>3</sup>	0.3	0.01~0.10	0.001~0.035

#### (3) Noise (Max. Value)

Time of Measurement	Unit	Standard value	Voluntary value	Measured Value
Morning	dB(A)	70	65	60
Day time		70	65	63
Evening		70	65	65
Night		60	55	55



### 3.4 Green Procurement and Purchasing

Our company has joined the Green Purchasing Network established in the Japan Environment Association and employs product design to minimize environmental load during the assembly of parts, production of materials and products, use and scrapping. We establish the items to be considered as the guidelines in the design development stage and during part and material procurement. We use these guidelines to check whether toxic materials are used in the parts and materials supplied to us by suppliers.

We endeavor to purchase items that are friendly to the environment. The ECO oriented products purchased through the network have reached 91,405 items (¥29.53 million). Among these, the items that comply with Green Purchase Law have reached 39,509 items (¥8.45 million), comprising 43.2% and 28.6% respectively. The purchase of ECO items through the network is promoted throughout the Yanmar group.

### 3.5 Environmental Preservation in Distribution (Activities of Yanmar Distribution Service)

We regard the packing as a part of our product and continue to it to minimize environmental load. We have stopped the uses of the throwaway wooden packing and corrugated cardboard packing. We have switched to the use of steel pallets that can be used repeatedly to save wood. We use small items, too, such as adhesive tape, buffer materials and other small packing items, that impose a smaller environmental load in view of toxic characteristics and ease of recycling.



Conventional packing



Improvement



Use of no packing



Mesh pallet (returnable)



Steel pallet (returnable)



Steel case

We have promoted the modal shift from truck transportation to the transportation by railway and sea to reduce environmental load in distribution. For example, in transporting engines from the Biwa Plant to Seirei Fukuoka Plant, we switched from truck transportation to Japan Railways container transportation. These efforts save wood, curtail CO<sub>2</sub> emissions, and reduce transportation costs.



In future, we plan to survey and grasp the overall distribution load related to our company's activities to proceed with improvement activities.

## 3.6 Other Activities

### 3.6.1 Activities of Administrative Divisions

Our head office, research institute, branches and other administrative divisions promote the following activities:

1. Recycling of utensils, provision, etc. for reducing wastes in general.
2. Use of recycled paper, copying on both sides of the paper, classification of wastes for recovery and recycling.
3. Use of both sides for copying.
4. Optimum temp. setting for air conditioners, turning off lights, etc. during lunch time.
5. Use of power-saving mode of PCs; power saving through screen saving during lunch time.

### 3.6.2 Environmental Exhibitions

Yanmar's environmental products were displayed and presentations made to wide acclaim at the International Environmental Business Messe (Fair) in Shiga Prefecture in November, 2003. Yanmar also participated in the New Environment Exhibition in 2003. We will exhibit our products also in 2004.



Int'l Environmental  
Business Fair, Lake Biwa

#### Exhibits at the Int'l Environmental Business Fair, Lake Biwa

- ECO diesel engine
- Commercial use dry type garbage treatment equipment
- Sludge reduction system
- Water treatment and membrane unit
- Household garbage treatment equipment
- Rice polisher



New Environment Exhibition

#### Exhibits at the New Environment Exhibition

- Industrial waste processors
- Domestic waste processors
- Compression containers
- Odor-removal devices
- Compost systems
- Water processing etc.

### 3.6.3 Environmental Education

Yanmar gives all employees training on environmental preservation once a year. The range of training provided includes general environmental matters and conservation measures, technologies and ISO14001. Education related to facilities and technologies that have a major environmental impact is given to the staff who actually work in those areas.

Area of responsibility	Content of General Education	Content of Special Education
Workers on special jobs	—	Work procedures for boiler, waste water treatment equipment
Internal monitors	—	ISO Environmental Audit Method 1. Environment ISO and internal rules 2. Environmental law regulations 3. Audit of process and results of environmental goal
General workforce	Requirements of ISO14001 etc.	—
New recruits	Basic points of environmental problems	—

Education for special environmental qualifications is also arranged with outside educational institutions.

#### Numbers of Staff with Major Environmental Qualifications

Qualification/Plant	Shiga Div.	Amagasaki	Tsukaguchi	Research Inst.	Head Office	Total
Pollution prevention supervisor (water quality)	11	1	1	2	6	21
Pollution prevention supervisor (atmospheric)	11	4	2	2	4	23
Pollution prevention supervisor (noise)	9	2	1	2	2	16
Pollution prevention supervisor (vibration)	4	1	2	2	1	10
Special designated industrial waste supervisor	19	3	0	0	0	22
Energy supervisor (electric)	3	1	0	0	1	5
Energy supervisor (heat)	3	1	2	0	1	7
High pressure gas safety officer	6	1	1	0	1	9
Chief electrician	10	2	2	2	5	21
Boiler technician	22	4	2	0	4	32
Internal environmental audit committee member	45	18	2	0	4	69
<b>Total</b>	<b>143</b>	<b>38</b>	<b>15</b>	<b>10</b>	<b>29</b>	<b>235</b>



Internal audit

### 3.6.4 Environmental Accounting

The purpose of environmental accounting is to grasp and analyze the costs of environmental preservation in business activities and the resulting effects quantitatively as far as possible for feeding back to business activities. The processes are also disclosed to persons concerned both externally and internally to obtain their understanding of the activities of our company. Methods of compilation comply with the Environmental Accounting Guidelines of the Ministry of Environment.

#### I Environmental Preservation Costs

The total cost in the 2003 fiscal year amounted ¥3,670 million, 91% of which belongs to the R&D cost. Since the principal businesses of Yanmar are the manufacture and sale of engines and R&D to develop new engines with improved environmental performance, such as raised fuel economy and cleaner exhaust, almost all R&D costs of our company fall under environmental cost.

#### I Effect of Environmental Preservation

We have been successful in reducing CO<sub>2</sub> emissions and water consumption by production volume, but oil and grease consumption and production of waste have increased.

#### I Future Developments

We started disclosure of information on environmental accounting this year. We will continue to disclose this information also as environmental management tools and indices.

unit: ¥1 million

No.	Classification of environmental preservation costs	Main items	Investment	Cost amount
			159.4	250.0
1	Cost of Controlling Environmental Load within Business Areas: (1) Public nuisance prevention cost (2) Global environment preservation cost (3) Resources recycling cost	Air quality, water quality, wastes, vibrations and noise	121.4	181.2
		Prevention of greenhouse effect, energy-saving, raising distribution efficiency	9.9	33.0
		Reduction of oil & grease, water and wastes	28.2	35.8
2	Cost of controlling environmental load in up & down streams	Green procurement, removal of products from market, recycling, etc.	0	0
3	Environmental preservation cost in administration activities	Environmental education, EMS, greenery promotion, information disclosure, environmental advertising, management personnel cost, etc.	0	76.7
4	Environmental preservation cost in R&D activities	Engine exh. gas improvement; R&D to improve environmental performance	179.5	3,346.0
5	Environmental preservation cost in social activities	Environmental volunteer, etc.	0	0
6	Cost to repair environmental damage		0	0.7
	Total		338.9	3,673.4

### Quantitative Effect

No.	Outline of Effect	Environmental effect index	Reduction volume	2003	2002
1	CO <sub>2</sub> emissions per production volume	t-C/¥1 million	10	1,680	1,690
2	Oil/grease consumption per production volume	Kl/¥1 million	-112	1,163	1,051
3	Water consumption per production volume	ton/¥1 million	6,285	46,442	52,726
4	Discharge of waste per production volume	ton/¥1 million	-45	328	283

### Economic Effect

unit: ¥1 million

No.	Outline of Effect	Economic items	Amount	2003	2002
1	Income from recycling	Sales of wastes, etc.	64.5	64.5	-
2	Cost reduction through energy saving	Electric power, fuel oil, etc.	-17.9	1,823.0	1,805.1
3	Cost reduction through resource-saving	Oil and grease, water, etc.	-4.2	446.6	442.4
4	Reduction of waste treatment cost	Improved yield, recycling, etc.	-7.6	74.4	66.8

#### Compilation Method

- (1) Period of compilation: Mar. 21, 2003~Mar.20, 2004
- (2) Range: Yanmar only, not consolidated.
- (3) Method complies with Environmental Accounting Guideline
- (4) Cost amount includes personnel cost and depreciation cost
- (5) For complex items, the portion relating to environmental improvement is extracted or calculated proportionally.
- (6) The R&D for new engine development relate mostly to combustion and exhaust gas improvements. Accordingly, almost all such costs have been appropriated
- (7) For economic effect, only the measurable items are appropriated; no assumed effect is appropriated.

### 3.6.5 Social Activities

#### Participation in Local Clean Up Activities

- Participation in the annual Biwa Day activities in the Biwa Zone, cleaning roads around the plants
- Neighborhood and commuting road cleaning campaigns implemented twice a year in the Amagasaki Zone



Road cleaning in the Amagasaki Zone



Road cleaning in the Amagasaki Zone

- Neighborhood road cleaning campaigns implemented twice a month around the head office



Road cleaning in the area of Head Office



Road cleaning in the area of Head Office

#### Beautifying Plant Site

Flower beds are arranged around the plant site at Nagahara Plant, located at the north of Lake Biwa. People can enjoy flowers in every season through this voluntary activity.



Flower beds, Nagahara Plant



### 3.6.6 Environment Preservation Activities by Group Companies

Yanmar Co., Ltd. not being as a single corporation but as a whole Yanmar group including many subsidiaries and affiliates promotes environment preservation activities. These activities by each group company are geared with the Global Environmental Committee and Environmental Coordination Committee of Yanmar Group.

#### (1) Yanmar Agricultural Machinery Machinery

##### Manufacturing Co., Ltd. (Energy & Resource Conservation)

###### ●Energy Conservation

In comparison with the result of two years earlier, we have improved energy conservation by 20%. This represents a combination of many small energy conservation activities. The effective energy conservation activities include:

A weekly timer was installed to the power distribution panel to turn off power automatically of the air conditioner standby power and upon finishing operation and during holidays.

In the air compressor room, we installed the thermostat automatic ON/OFF timer to the ventilation fans to save power.

In order to promote turning off of power after work and on holidays, we have implemented the following:

1. Turning off power upon closing based on the check sheet for the machine tools, conveyers, air conditioners, ventilation fans and lighting.
2. If an item is not turned off, the night guard reports the oversight in his daily report.

###### ●Effective Use of Resources

The water consumption was reduced by 32% in two years. We extended the water replacement interval of the pre-coating cleaning tanks (800 liters x 6 tanks), etc. The tank water quality is checked to extend the replacement interval.

#### (2) Kanzaki Kogyukoki Mfg. Co. (Use of Volatile

##### Organic Compounds Reduced)

Kanzaki Kogyukoki Mfg. used 35 tons of chemicals regulated under PRTR law in 2000. About 70% consisted of volatile organic compound based cleaning agent for use with cleaning such work pieces as gears before and after heat treatment, (carburizing). To reduce the consumption of such chemicals, we introduced vacuum degreasing cleaning equipment using hydrocarbon based cleaning agent. Through the use of this equipment, we have contributed to the environment and reduced costs without lowering the cleaning performance:

Environment improvement...Use of chemicals regulated under PRTR abolished.

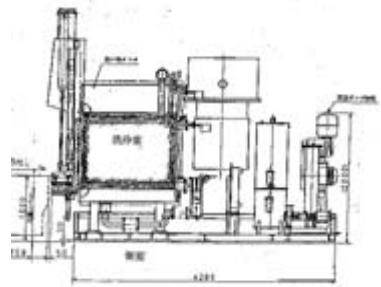
Cost reduction...Reduction by 56%



Power control panel with weekly timer



Ventilation fan with thermostat



Vacuum degreasing and cleaning equipment, (installed in May 2002)



Vacuum degreasing of carburizing gear, etc.

## IV. More Information

Yanmar wants to inform society at large about the effects of its business operations on the environment and environmental protection activities, in order to that these may be developed arm in arm with the whole community.

Two-way communication is essential. This environmental report is Yanmar's third publication of this kind and we may not have included everything you wanted to see. Please let us know your opinions, impressions and questions so that we can improve future editions. We look forward to receiving your comments at the address shown below.

### Inquiries about this Environmental Report

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### Yanmar Home Page and other Inquiries

The latest business activities of Yanmar and Yanmar group companies are described in a simple and attractive format. The Environment page introduces various other environmental activities not covered in this report.

To send inquiries via the net, please visit the site shown below.

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Yanmar Home Page  
<http://www.yanmar.co.jp/>

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Yanmar welcomes all inquiries on both environmental and other subjects via the inquiry corner on the home page. Please feel free to contact us at any time.

We the Yanmar Group seek through creative technologies and human warmth to give the world new worth and enrich the lives of people everywhere in beautiful harmony with the global environment.



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