One of the major FY2000 achievements in the procurement area was the development of the “Environmental Purchasing Guidelines” in Europe and North America, which were issued from the local business affiliates, resulting in major progress towards the creation of a global structure.

In the production area, all of Toyota’s production plants and housing works achieved the goal of “zero landfill waste” three years ahead of schedule. The FY2000 goal of stabilizing both the total CO2 emission and CO2 emissions per sales unit to the 1990 levels, in a continuing effort to contribute to the prevention of global warming, was also achieved on schedule.

### Procurement

**Propaganda of the Environmental Purchasing Guidelines in Japan**

In order to promote environmental measures through comprehensive actions that include suppliers, Toyota adopted the “Environmental Purchasing Guidelines” (hereafter referred to as the “Purchasing Guidelines”) and presented them to all of its suppliers of automobile parts and materials in March 1999, asking for their cooperation regarding the following items:

1. Voluntary actions aimed at enabling each supplier to acquire ISO 14001 certification by 2003
2. Management of substances of environmental concern and provision of related data to Toyota

With respect to (1) above, 98 companies successfully obtained certification in FY2000. As a result, the cumulative total of certified companies now stands at 296 out of the 505 targeted companies.

**Propagation of the Purchasing Guidelines Overseas and Issuance in Europe and North America**

In order to globally expand cooperation with suppliers, each of Toyota’s overseas affiliates began the necessary preparations for issuing the Purchasing Guidelines. Toyota, through each overseas affiliate, requests the suppliers in each country and region to follow overseas Purchasing Guidelines. Toyota creates the basic policy and requirements and presents them to its overseas affiliates. The overseas affiliates in turn create Purchasing Guidelines that are best suited to local conditions and hold seminars to explain the guidelines to their suppliers.

In North America, Purchasing Guidelines were issued in August 2000, and in the near future, suppliers there will be asked to manage substances of environmental concern related to Toyota products. In April 2001, the Purchasing Guidelines for Europe were issued in conjunction with the start of operation of the French plant, and Toyota requested cooperation from approximately 200 suppliers. Toyota plans to gradually implement the Purchasing Guidelines in other regions as well, strengthening cooperation with its suppliers overseas, as in Japan.

#### Items Specified in the Overseas Purchasing Guidelines

**Example:**

1. Reducing packaging material
2. Transporting hazardous materials, etc.

*EMAS (Eco-Management and Audit System): Voluntary EU regulation related to environmental management adopted by EU members, which took effect in 1995*
Further Strengthening of Cooperation toward Comprehensive Environmental Measures

In the procurement area, Toyota took comprehensive environmental measures. By cooperating with its suppliers, Toyota reduced environmental risks, and controlled and reduced the use of specified chemical substances.

### Actions Taken in FY2000

- **Environmental risk reduction activities**
  - Strengthened the measures for environmental risk by building a communication structure and having each supplier assign a person in charge of environmental management

- **Hexavalent chromium reduction activities**
  - As part of the activities to reduce substances of environmental concern, Toyota held orientation seminars for its suppliers on the importance of reducing hexavalent chromium

- **PRTR Law-related activities**
  - Held seminars to explain PRTR Law compliance and reduction activities to raw material and supplementary material suppliers

### Promoting Green Purchasing

In FY2000, Toyota began serious efforts toward green purchasing targeted at office supplies and office equipment such as personal computers. Toyota developed an internal criteria for buying green products (e.g., products with environmental labels), and has been promoting actions to achieve a 100% switch to green products.

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### Production

#### Volume of Resources Input and Volume of Substances Released into the Environment in FY2000

- **Input**
  1. Total material volume input (1.67 million tons)
  2. Amount of material reused in automobile production processes of Toyota (530,000 tons)
  3. Total energy consumption \( (38.6 \times 10^6 \text{ GJ}) \)
  4. Renewable energy consumption
    - Wind power generation: \( 346 \text{ GJ} \)
  5. Water consumption (16.8 million m\(^2\))

- **Gases emitted into the atmosphere**
  6. Volume of greenhouse gases\(^1\) emitted (1.72 million tons-CO\(_2\))
    - CO\(_2\): 1.70 million tons
    - Gases other than CO\(_2\): 20,000 tons

- **Volume of generated waste**
  7. Total amount of wastewater (13.20 million m\(^3\))
  8. Volume recovered as thermal energy by Toyota (26,000 tons)
  9. Total volume of waste generated (525,000 tons)
    - Volume reused (510,000 tons)
    - Final volume disposed of (15,000 tons)\(^2\)

The figure above captures the total volume of resources used during Toyota’s production process (input) and the total volume of substances released (output) into the environment. In FY2000, a total of 1.67 million tons of raw materials and supplementary materials, a total of \( 38.6 \times 10^6 \text{ GJ} \) of energy in the form of electricity, fuel, etc., and 16.8 million m\(^2\) of water were used in Toyota’s production activities.

Toyota emitted 1.72 million tons-CO\(_2\) of greenhouse gases into the atmosphere, and released 13.20 million m\(^3\) of water into waterways. Of the total volume of waste generated 26,000 tons were recovered as thermal energy by Toyota. Total waste volume came to 525,000 tons, of which 510,000 tons (97% of the total waste volume) were reused.

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1. **PRTR:** Pollutant Release and Transfer Register
   - For details see p. 30

2. **Green purchasing:**
   - Toyota classifies the buying directly related to production as “procurement” and the buying of office-related products and equipment as “purchasing”
Promoting the Use of IT in the Environmental Management System

In order to constantly improve environmental performance, building a system that enables continuous improvement activities is one of the important issues. In the production area, Toyota is taking steps to use IT as a practical and effective tool to carry out environmental management. Because the use of IT simplifies manual work, reduces the number of processes to be monitored, and accelerates improvement in environmental performance, Toyota plans to develop more effective systems in the future.

As a specific example, in FY1999, Toyota began introducing the "Management of Energy Consumption Estimation and Actual Results System" in the area of energy management, and implemented this system for electricity use at all of its plants in FY2000. Toyota is also developing similar systems for other energy types such as steam. Also in FY2000, Toyota worked on introducing the "Environmental Information Network System" for the promotion of consolidated environmental management, the "Prior Assessment System for Environmental Preservation" related to the prior assessment of materials, and the Environmental Support System in the Production Engineering Division. Toyota plans to begin using these systems in FY2001.

Recent IT-related Actions

- Prior Assessment System for Environmental Preservation
  - Shortens the prior assessment period, enables a quick decision on whether or not a substance may be used, enables paperless operations, and total management of composition data.

- Environmental Information Network System
  - Tool for summarizing environmental actions and results at all Toyota consolidated companies, and for utilizing the collected information to provide quick feedback to the individual companies and share it among them.

- Management of Energy Consumption Estimation and Actual Results System
  - Supports day-to-day energy conservation management by calculating the estimated energy consumption for each energy management section and comparing it to the actual usage.

- Production Engineering Environmental Support System
  - Effectively supports environmentally considerate car designing by searching the Web for laws and regulations that are applicable to the equipment to be procured, and transferring application documents to the division in Toyota which is responsible for registration.

Establishment of Eco Research Co., Ltd. in Support of PRTR Activities

Based on the accumulated database related to chemical substance management, Toyota established a PRTR Information Processing System jointly with the Hitachi Group, and established Eco Research Co., Ltd. (51% owned by Toyota) in March 2001. Eco Research's business involves the appropriate management of chemical substances and technical support related to PRTR. For example, using the Internet, it provides a unified MSDS management system and chemical substance information to companies. Eco Research plans to establish a comprehensive support system related to chemical substances by gradually implementing services like environmental impact evaluation of emission volumes, documentation of chemical substances and the LCA analysis system.

1. PRTR (Pollutant Release and Transfer Register): Enacted as a law in 1999. Beginning in FY2001, businesses must document and report the amounts of applicable substances released or transferred, to the government, which will then publish the collected results beginning in FY2002.

2. MSDS (Material Safety Data Sheet): Data sheet that must be provided during any transaction involving a chemical substance subject to the PRTR Law.
Thorough Implementation of Proactive Prevention Measures

FY2000 Evaluation Results of the Prior Assessment System for Environmental Preservation

When introducing new raw materials, supplementary materials or when expanding its plants, Toyota conducts a prior assessment of the environmental impact including air, water quality, offensive odors, noise, vibration, waste and chemical substances based on its Prior Assessment System for Environmental Preservation.

In FY1999, the number of prior assessments conducted increased as a result of the addition of an electronic parts plant to the Hirose Plant and others. However, in FY2000, the number decreased since there were few plans to introduce new raw materials or supplementary materials.

### Items Evaluated by the Prior Assessment System for Environmental Preservation

![Chart showing items evaluated by the Prior Assessment System for Environmental Preservation]

Revision of the Prior Assessment System for Environmental Preservation

With the goal of thorough prevention of environmental impact, Toyota established the Prior Assessment System for Environmental Preservation in 1984. Beginning in 1994, Toyota strengthened chemical substance control and began operating a system that can keep track of the targeted 2,232 chemical substances. The system helps to understand “what chemical substances were used and where, and in what quantities.”

Furthermore, in FY2000, in response to the PRTR Law, and to conduct global measures that comply with the regulations in each country in conjunction with the promotion of consolidated environmental management, Toyota revised the Prior Assessment System for Environmental Preservation. Major revisions include the following:

1. Increased the number of chemicals prohibited for use from 149 to 457, while increasing the number of substances subject to control, including evaluation of future toxicity, to 3,420
2. Prohibited the use of containers that require to be disposed of in landfills

### Usage Status of Substances Subject to PRTR

In FY2000, 38 substances subject to PRTR, totaling approximately 22,000 tons, were used at Toyota’s production plants and housing works. Of this volume, 24% was released into the atmosphere or waterways, or transferred out as waste. Data for individual production plants and housing works are included at the end of this report.

### Emergency Response Training

Toyota has been conducting emergency response training as a part of preventive measures. The facilities requiring emergency responses have been registered and regular on-the-job training is being conducted. Concerning those facilities that may have a particularly large impact on the environment, simulations of emergency situations for training are held more than once a year, based on procedure manuals, and these procedures are confirmed and reviewed periodically.

### Total Material Balance of Substances Subject to PRTR

![Diagram showing total material balance of substances subject to PRTR]

1. Treated volume refers to the volume of substances subject to PRTR that are incinerated, neutralized, decomposed, or changed to other substances through chemical treatment.
2. Consumption volume refers to the volume of substances subject to PRTR that are changed to other substances through chemical reactions or are contained in or accompanied with products and transported outside the plant.

Voluntary Information Disclosure to Local Communities

To promote communication with the people in the surrounding communities, Toyota has been actively promoting voluntary information disclosure. In FY2000, community councils were formed in which three groups, Toyota plant representatives, community representatives, and government personnel responsible for environmental issues, participated and held dialogs. In all Toyota plants and housing works seminars were held ahead of the enactment of the PRTR Law and plant tours were conducted.

In the community councils, Toyota explained its framework for chemical substances management, disclosed substance release data, and reported on environmental conditions, including air and water quality, noise, vibration, offensive odors, the actions being taken by the plants, as well as complaint status. The responses from the community representatives who attended these community councils included, “Information disclosure to the surrounding communities is good,” “I now have a better understanding of chemical substances,” “The combination of the meeting with a plant tour helped me understand the situation better.” Toyota plans to hold these meetings once a year in the future.
Since FY2000 was the last year of the Second Toyota Environmental Action Plan, Toyota took actions striving to achieve the goal of “stabilizing CO₂ emissions volume and emissions per sales unit at 1990 levels by the end of FY2000.”

Some of the key actions that Toyota took include the following:
1. streamlining the production system through line integration
2. increase in efficiency of new lines
3. introduction of high-efficiency cogeneration systems
4. self-wheeling of excess electrical power

These actions focused on improving productivity and measures for effective energy use.

As a result, total CO₂ emissions volume was reduced by 13% from the 1990 level while CO₂ emissions per sales unit were reduced by 17%, achieving Toyota’s goals in both cases.

1. Self-wheeling: Transmission of excess power to specific plant sites by leasing the electric power company’s existing transmission lines

In order to match its operation system to the production load as in FY1999, Toyota conducted line integration including transferring RAV4 production from the Motomachi Plant to the Tahara Plant, thereby improving productivity and reducing energy consumption.

In the installation of a new AZ series engine line at Kamigo Plant, Toyota took advantage of the know-how gained in the installation of the NZ series engine line in FY1999. Thorough energy-conservation measures were incorporated, such as decreasing production processes (net shaping), downsizing equipment, and reducing vehicle volume.

Furthermore, at the Kinuura Plant, maintaining a high operation rate from the start of CVT (continuously variable transmission) production significantly reduced the energy consumption associated with introducing a new line.

Contributing to Prevention of Global Warming

In order to effectively utilize fossil fuels, Toyota has been actively promoting the introduction of cogeneration systems, which offer higher energy conversion efficiency.

At the Hirose Plant, which was expanded in correspondence with an increase in the production of electronic components, a system with 7,500kW generation capacity was introduced in conjunction with the plant expansion plan. As a result, CO₂ emissions were reduced by 2% despite the increase in components production. Before the introduction of this system, the operating situations of the existing boilers, heating sources for air conditioning, etc. were investigated in detail to ensure optimal operation linkage to the new system.

Energy Usage during Toyota’s Automobile Production Process and CO₂ Emissions per Sales Unit

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<th>Energy Usage Volume (CO₂ emissions)</th>
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<td>Energy Usage during Toyota’s Automobile Production Process and CO₂ Emissions per Sales Unit</td>
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- For CO₂ emissions, CO₂ equivalent values are now used instead of carbon equivalent values
- Conversion formula: \( (\text{kg-CO}_2) = (\text{kg-C}) \times 3.67 \)

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Component Ratio of Energy Used during Automobile Production Process

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As electricity deregulation progressed in FY2000, Toyota signed a self-wheeling service agreement with Chubu Electric Power Co., Inc., enabling the power generated by cogeneration systems to be effectively utilized among various plants, thus ensuring the effective operation of the cogeneration systems Toyota owns.

Participation in the Purchase of Green Power

To support wider use of green power, which reduces CO₂ emissions by using natural energy sources, Toyota became the first company in the automobile industry to participate in the Green Power Certification System¹ and concluded a wind power generation subcontracting agreement. Based on this agreement, Toyota will use 2 million kWh of wind-generated power per year starting in December 2001.

1. Green Power Certification System: In order to promote green power, a corporation can subcontract the generation and supply of wind power to Japan Natural Energy Company Limited, and receive a Certification of Green Power indicating the amount of wind power being generated.

Reducing Waste

Toyota took actions striving to achieve one of the goals of the Second Toyota Environmental Action Plan, “waste volume reduction by 75% compared to 1990 by the end of FY2000.” Through steady actions and enhancement of activities designed to reduce waste generation at the source, such as the “5R Program”² and the “Zero Landfill Waste Program,” Toyota achieved its goals, reducing waste⁴ volume generation by 78% and scrap material⁵ generation by 48% compared to 1990.

2. 5R Program: Activities to reduce waste at Toyota’s plants: the five Rs are Refine, Reduce, Reuse, Recycle, and Retrieve energy

3. Zero landfill waste program: A reduction in landfill waste generated directly by plants to less than 5% of the 1995 level

4. Waste: Total of waste subjected to intermediate treatment processes, such as incineration, and those disposed of in landfills

5. Scrap material: The total of all waste including that recycled for free or for a fee. An index for evaluating the reduction of waste at the source
Achieving Zero Landfill Waste at All Plants and Housing Works

Toyota achieved its goal of “zero landfill waste” by the end of FY2001 at vehicle assembly plants and by the end of FY2003 for unit plants and housing works, well ahead of the original schedule, meeting this goal at all its plants and housing works by December 2000. This was made possible by an all-company effort such as:
- Project teams were formed under the direction of the General Managers at each plant
- The know-how and case studies from a model plant were quickly propagated
- Employees came up with original and inventive ideas
- All employees participated

Specifically, the promotion of reduction of waste at the source, recycling by thorough classification and collection, and the development of recycled products using waste as resource were highly effective. As a result, Toyota’s resource reclamation rate has also been steadily climbing.

The Third Toyota Environmental Action Plan includes the goal of “reducing combustible waste to 1/3 or less compared to FY1990 by the end of FY2005.” Toyota began working towards this goal in FY2001 to achieve “zero combustible waste” using the Motomachi Plant as the model plant, and has been taking actions to completely eliminate waste at the source.

Reduction of waste at the source

Until recently, the spatter, which gets scattered on the floor during the welding process, had to be collected as refuse from floor-grooves and disposed of in landfills. Toyota began working on achieving spatterless welding by setting optimal welding conditions, e.g., modifying the welding gun angle and optimal adjustment of the welding current, and by improving press accuracy, and succeeded in reducing the volume of spatter from 60 tons/year to 10 tons/year at the Tsutsumi Plant. Furthermore, this 10 tons/year of spatter is recycled as a raw material, and actions are being taken to achieve spatterless welding at all Toyota lines.

In painting processes, Toyota has been working on reducing waste paint and waste thinner. At the Takaoka Plant, a newly developed cartridge method paint system was introduced, significantly reducing loss during color changes.

The Total Wastewater Treatment Center uses a biochemical treatment method, which uses microbes for removing organic matter. The organic sludge generated when these microbes multiply used to be extracted and disposed of as waste. However, an ozone oxidation equipment was added to the wastewater treatment process, reducing the volume of the organic sludge generated. This improvement, along with other measures, reduced the volume of wastewater sludge from 10,000 tons in 1999 to 7,500 tons in 2000.

Welding Process with Significantly Reduced Spatter

Sludge Reduction Using an Ozone Oxidation Equipment

Achieves zero organic sludge generation by having the ozone oxidation equipment biologically decompose the multiplied microbes, and circulating them back to the aeration tank as nutrients.

1. Spatter: Powder resulting from the sparks generated when steel powder burns during the welding process
2. Aeration tank: Biological treatment tank for removing organic matter from wastewater; supplies the oxygen needed for microbial activity
Reducing Substances of Environmental Concern

Toyota evaluates (1) substances that are released in large volumes, (2) substances that are highly toxic, and (3) substances whose risk exceeds internal standards. Toyota also has been working to reduce toluene and xylene, substances which are subject to PRTR and are released into the atmosphere, as well as nickel which is discharged into waterways.

Reducing VOC Emissions

Toluene and xylene, which account for the majority of VOCs (Volatile Organic Compounds) generated at Toyota, are the main ingredients of paint thinners, majority of which are generated from painting processes. Toyota began using thinners with lower toluene and xylene contents and introduced a new painting system into the painting line at the Takaoka Plant.

The new painting system uses the following:
- Water-based paints with low environmental impact
- Cartridge method painting system that reduces paint loss during color changes and significantly reduces purge thinner usage
- Painting robots that can paint without any waste
The new paint system thereby established a technology that reduces VOC emissions to 35g/m² in FY2000 in a mass-production line. Toyota plans to expand the application of this new technology to the painting lines at other plants in the future.

Reducing Nickel Discharge

Nickel is contained in paint primers and plating processes, and most nickel waste is generated in painting processes. Toyota is working on reducing nickel discharge volume by (1) developing supplementary materials not containing nickel, and (2) treating wastewater containing nickel. Since the development of supplementary materials takes time, Toyota introduced a chelating* coagulation process, which employs a chelating agent to cause the nickel contained in wastewater to coagulate and settle, for use in the wastewater treatment plants at applicable plants. As a result, the nickel concentration in the wastewater at these plants was reduced to 0.1mg/L or lower.

Storing PCB

Toyota is safely storing end-of-life transformers containing polychlorinated biphenyl (PCB) as part of an insulating oil, in accordance with the standard specified by law. Measures have been implemented to prevent leakage, soil contamination, or the escape of evaporated gas, in the unlikely event of a leakage. Currently, Toyota has 3,146 transformers in storage.
Conserving Water Resources

Toyota not only thoroughly maintains and preserves the facilities and equipment that use water, but is also trying to completely eliminate unnecessary water usage through daily management. In particular, vehicle assembly plants, which have painting processes that use a lot of water, have set up a goal of “reducing water usage per unit produced by 20% from the FY1995 level by the end of FY2005.” Towards this goal, they have investigated the processes that use water, installed water meters to grasp actual usage, and are developing action plans based on these results.

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■ Trend in Water Usage in the Four Vehicle Assembly Plants

■ Trend in Total Amount of Water Usage in Vehicle Assembly Plants

Other Environmental Data

Data on the results of activities concerning atmospheric and water pollution has also been included. Data on COD* was also added beginning FY2000.

■ Trends in Amount of Sulfur Oxides Emissions (1,000 m³)

■ Trends in Amount of Nitrogen and Phosphorus Emissions Included in Wastewater (Tons)

■ Trends in COD of Wastewater (Tons)

Measures to Prevent Eutrophication of the Ise Bay

In order to reduce organic matter, nitrogen, and phosphorus, which cause eutrophication, Toyota has been promoting measures such as reduction of the use of raw materials and supplementary materials, and development of alternative materials.

By adding denitrification facilities for removing nitrogen from untreated wastewater to the Total Wastewater Treatment Centers at four parts plants from 1998 to 1999, Toyota succeeded in reducing the nitrogen content of the wastewater by approximately 20% in FY2000.

Toyota also reduced phosphorus, for example, by modifying the coagulation sedimentation conditions at the primary wastewater treatment facilities for painting processes.

■ Denitrification Process Flow

*COD (Chemical Oxygen Demand): One of the indices that express the amount of organic matter in water

*Principle: Nitrogen in untreated wastewater is oxidized into nitric acid, etc. in the nitrification tank, which is then reduced by a chemical added in the next denitrification tank into nitrogen gas. It is then removed from the wastewater and dispersed into the atmosphere

* Return flow of sludge

* COD (Chemical Oxygen Demand): One of the indices that express the amount of organic matter in water
Soil and Groundwater-related Measures

Although in the past Toyota has used three chlorinated organic solvents, which are known for causing contamination in soil and ground water, it has already completely phased out their use. Trichloroethylene has been widely used since the 1950’s by many industries, uninformed of its hazardous nature. Toyota has phased out its use in August 1989, even before it was designated as a hazardous substance by the Japanese government in October of that year. Toyota also phased out the use of 1,1,1-trichloroethylene in July 1995 and dichloromethane in March 1997. Toyota has been voluntarily investigating the effects of pollutants on soil and ground water within its plants and housing works since 1992, and has been implementing remediation measures in contaminated areas and reporting the facts to both the government and the surrounding communities.

Early Implementation of Investigation and Countermeasures

In 1992 there were no environmental standards on soil or ground water available in Japan. So Toyota began studying the investigation technologies and the status of remediation technologies used in Europe and the U.S., and since then has been taking active measures. By May 1996, soil samples had been taken at approximately 10,000 locations and groundwater samples had been taken at approximately 200 monitoring wells inside and outside the buildings in 12 plant sites. The results showed that trichloroethylene was present at concentration levels between less than 0.002 and 0.93mg/L in soil and between less than 0.002 and 3.63mg/L in ground water at six plants, i.e., Honsha, Motomachi, Kamigo, Takaoka, Miyoshi, and Tsutsumi. Cis-1,2-dichloroethylene, which is generated through the biological decomposition of trichloroethylene, was found to be present at concentration levels between less than 0.004 and 1.84mg/L in ground water. Soil contamination by 1,1,1-trichloroethylene was confirmed at one location, but the level in ground water was below environmental standards. The dichloromethane concentration levels were also below environmental standards in both soil and ground water.

Approximately 70% of Soil Remediation Completed

Based on the investigation results, Toyota developed a remediation plan and has been remediating soil using soil vapor extraction method. Approximately 70% of the areas have been remediated so far, with the remaining areas scheduled for completion by the end of FY2001.

Groundwater Contamination Prevention Measures Complete

In terms of groundwater contamination prevention, Toyota put the highest priority on preventing the contaminated water from flowing outside company sites, and adopted barrier-type wells and a pump and treat technology using aeration equipment. In 1997, Toyota completed an effluent prevention measure, which involved the digging of barrier-type wells along the downstream perimeters of its plant sites and pumping and remediating the ground water from these wells. In some cases, this effluent prevention measure altered the flow of ground water, resulting in higher pollutant concentrations than the initial measurement values observed within company sites. However, after soil remediation is completed by the end of FY2001, the contamination levels of ground water are expected to drop as the migration of pollutants from soil to ground water will stop. By the end of FY2000, Toyota had invested approximately 8.5 billion yen in soil and groundwater remediation measures.

Voluntary Information Disclosure

In January 1999, Toyota voluntarily reported its remediation measures, etc. to the government, and has been reporting the remediation status on a regular basis. Beginning in 2000, ahead of the enactment of the PRTR Law, Toyota has been publicizing discharge volumes of chemical substances and explaining the environmental impact evaluation results according to discharge volumes of chemical substances at each of its plants and at community councils to promote communication with people in the surrounding communities. In April 2001, Toyota’s efforts related to soil and groundwater remediation were also explained.

<table>
<thead>
<tr>
<th>Soil and Groundwater Remediation Measures (conceptual)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Image" alt="Diagram of soil and groundwater remediation measures" /></td>
</tr>
</tbody>
</table>

### Target Substances and Discontinuation Timing

<table>
<thead>
<tr>
<th>Substances</th>
<th>Discontinuation Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichloroethylene</td>
<td>August 1989</td>
</tr>
<tr>
<td>1,1,1-trichloroethane</td>
<td>July 1995</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>March 1997</td>
</tr>
<tr>
<td>Degreasing and cleaning of parts</td>
<td></td>
</tr>
<tr>
<td>Vacuum degreasing, etc.</td>
<td></td>
</tr>
<tr>
<td>Alkaline cleaning, etc.</td>
<td></td>
</tr>
</tbody>
</table>

### Trichloroethylene Measurement Values in FY2000

<table>
<thead>
<tr>
<th>Plant</th>
<th>Soil</th>
<th>Ground water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honsha</td>
<td>less than 0.002 - 1.50</td>
<td>less than 0.002 - 2.88</td>
</tr>
<tr>
<td>Motomachi</td>
<td>less than 0.002 - 2.43</td>
<td>less than 0.002 - 2.61</td>
</tr>
<tr>
<td>Kamigo</td>
<td>less than 0.002 - 0.72</td>
<td>less than 0.002 - 2.58</td>
</tr>
<tr>
<td>Takaoka</td>
<td>less than 0.002 - 0.96</td>
<td>less than 0.002 - 3.09</td>
</tr>
<tr>
<td>Miyoshi</td>
<td>less than 0.002 - 2.64</td>
<td>less than 0.002 - 2.64</td>
</tr>
<tr>
<td>Tsutsumi</td>
<td>less than 0.002 - 2.46</td>
<td>less than 0.002 - 1.14</td>
</tr>
</tbody>
</table>

1. Measurements are taken at all plants and housing works
2. Has not been detected in plants other than those listed
3. At the three housing business sites, measurements began in 1997
Setting its Own High Standards and Implementing Environmental Measures

The Miyoshi Plant, with about 1,500 employees, began operating in 1968 as a plant manufacturing chassis parts. It produces parts such as propeller shafts, steering columns, and constant velocity universal joints. In particular, it has a capacity of producing approximately 2 million propeller shafts annually and is a major production base accounting for about 80% of Toyota’s supply.

The Miyoshi Plant is currently engaged in MVP activities¹, which are intended to increase its capabilities and vitalize its organization by establishing individual goals in areas such as product quality, safety and costs, and making efforts to achieve those goals. The plant is also linking these efforts to environmental measures and is setting goals that are higher than company-wide level and working to achieve them.

Introduction of New Technology and Full Participation to Reduce CO₂ by Thoroughly Eliminating Muda (waste)

In FY2000, CO₂ emissions from the Miyoshi Plant were 62,000 tons, a 27% reduction from the 1990 level and well below the goal of 76,000 tons. This was in part the result of the introduction of a cogeneration system. The plant has succeeded in increasing the efficiency of cogeneration by supplying, with priority over electric power generation, the steam generated by waste heat boilers to the heat treatment process, which requires high volumes of steam.

As a result, the Miyoshi Plant was able to shut down one of its three boilers used for generating steam and can supply 70% of electricity demand through cogeneration, cutting CO₂ emissions by 10,000 tons.

*For CO₂ emissions, CO₂ equivalent values are now used instead of carbon equivalent values

Structure of the Miyoshi High-efficiency Cogeneration System

1. MVP (Miyoshi Valuable Profit Center) Activities: Activities intended to make the Miyoshi Plant a business with higher added value (profitability)

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² For CO₂ emissions, CO₂ equivalent values are now used instead of carbon equivalent values

3. Air blow: Using compressed air to blow off moisture and other substances on machined parts

3. Oil mist supply air: Air used to supply lubricating oil to the bearings of rotating shafts
In order to increase the efficiency of equipment energy use, the plant has integrated its equipment—mainly in the heat treatment process—to low-load facilities. By modifying temperature conditions and materials based on innovative arrangements of heat-treated parts, the plant has been able to consolidate approximately 50 heat treatment furnaces, thereby reducing CO₂ emissions by 2,000 tons.

Educational activities are an important part of raising environmental awareness. The Miyoshi Plant works hard to raise awareness concerning the environment in order to strengthen environmental preservation activities with participation from all employees through measures such as holding the Environmental (Energy Conservation and Zero Emissions) Fair.

Promoting More Effective Use of ID Sheets to Achieve Zero Waste of All Types

One important tool used to support the Miyoshi Plant’s “zero landfill waste” activities has been the “ID Sheet,” a type of waste record. The plant conducts thorough investigations of all waste and determines the processing or disposal method based on a determination of the sources and composition. The results are systematized and indicated on ID Sheets, and by implementing thorough sorting at the source, the plant was able to achieve zero landfill waste ahead of schedule.

The plant has now set as its goals to achieve the following by the end of FY2003:

1. Eliminating the generation of all waste
2. A 50% reduction in scrap materials by implementing measures at the sources where the waste is generated

As a first step, classifying of waste will be further strengthened. In order to implement classification suitable for each source and to clarify managerial responsibilities, the outdoor resource stations used in the past were eliminated and new stations that increase classification from 11 different types to a maximum of 20 types by groups were installed. Moreover, the new station allows waste volume calculation by group. The plant through its extensive activities is promoting waste reduction at its source and recycling through effective use of the ID Sheets.

Miyoshi Plant, Adjacent to Residential Neighborhoods, Puts Top Priority on the Local Environment

According to Yoichiro Harada, an environmental preservation manager, “preventing any irregularities and complaints is one of our key jobs and responsibilities to the local community.” The Miyoshi Plant lies adjacent to a residential district, so it pays close and detailed attention to the effect it has on the local area.

To take water quality as one example, the plant internally manufactured a device, named “Mihari-kun,” to detect irregular wastewater that can have a detrimental effect on water processing functions and installed it at water outlets in every building to assist in the early detection of problems at the source.

In addition, prior to the installation of the cogeneration system, the plant performed detailed analysis using computer simulations in order to implement sound and vibration countermeasures to prevent any effect on the surrounding areas. The plant also conducted regular patrols at the site property lines for early detection of sensory pollution such as noise and offensive odors.

In order to gain the understanding of the local residents, each year the plant invites the heads of each ward for a plant tour and discloses corporate information to community councils. In an effort to keep the local environments beautiful, the Miyoshi Plant also participates in beautification activities carried out in its neighborhood, as well as in the Miyoshi Pond cleaning activity organized by Miyoshi Town.
The Kinuura Plant, which is located in the waterfront industrial area on the Kinuura Bay, began operations in 1978 as a plant manufacturing drive train parts. Today, its 2,500 employees manufacture transmissions, constant velocity universal joints, continuous variable transmissions (CVTs), and other parts. The Kinuura Plant conducts integrated production of drive train parts starting with raw materials including machining and assembly, and accounts for 24% of Toyota’s total transmission production (110,000 units per month). The finished products are supplied to Japanese plants as well as overseas vehicle assembly plants and unit plants.

Achieving Thoroughly Clean Wastewater through Preventive Measures

One feature of environmental measures at the Kinuura Plant is “achievement of thoroughly clean wastewater as a top priority,” according to Akira Takahashi, an environmental preservation manager. The Kinuura Plant, which discharges processed water into the Kinuura Bay, has undertaken actions with an emphasis on clean wastewater since it was established. Since the plant is located adjacent to a marine area with strict COD standards, Toyota installed at the plant its first wastewater treatment center that utilizes an activated sludge treatment system with continuous activated carbon absorption system. In order to implement thorough preventive measures, the plant pays close attention to numerous details including separation of storm drains from roads and from buildings and accumulation of rainwater that is mixed with oil from roadways so that it can be cleaned at the wastewater treatment plant.

If an irregularity should occur, responses and safety structures are in place. Each year a local committee (“Kinuura Harbor Oil Spill Prevention and Countermeasures Committee”) participates actively in the oil spill prevention training conducted under the guidance of the Japanese Coast Guard. The expertise acquired from this is particularly useful for the training conducted regularly within the plant. In addition to day-to-day management and inspections, environmental patrols are performed regularly, even on holidays, in preparation for accidents.

In implementing clean wastewater, raising awareness concerning the importance of water is essential. The Kinuura Plant also engages in active reuse of processed water in order to increase understanding of the importance of water through creative innovations. Of the 2,200 tons of water processed each day, approximately 10% is used in toilets and for watering trees and plants.

Reducing Waste such as Sludge from Water

The grinding residue generated during machining processes is processed as waste with a water content of approximately 40%. In order to prevent residue from sinking to the bottom of tanks, the Kinuura Plant developed a new coolant device, for which a patent has been acquired, that uses excess flow to make it float and wash away. By also using a high-performance water separator, the water volume was reduced and the amount of grinding residue reduced from 420 tons to 360 tons.

For the forging process, the plant also switched to a mold lubricant, which is high in wastewater processing performance and installed additional cleaning equipment to reuse the mold lubricant, so that the volume of waste fluid and wastewater and sludge generated have both been reduced.

Toyota installed its first ozone oxidation device, a new technology, at the wastewater processing plant. Since microorganisms are affected by decreases in the water temperature, the plant had considerably difficulty in setting the operating conditions during winter, but these problems were overcome and a device that could be deployed at all plants was completed. As a result of these improvements, sludge was reduced from 1,200 tons to 870 tons.

1. Mold lubricant: A lubricating agent that makes it easy to remove forged items from molds
2. Ozone oxidation device: A device that uses ozone to decompose microorganisms
In 1998, the Kinuura Plant was awarded the Chubu Bureau of International Trade and Industry, Director General’s Award for “Plants with excellent energy management (Thermal Category),” for its reductions in CO2 emissions through energy consumption reduction and energy conservation.

In FY2000, a switch was made to an alkaline rinsing agent that can be used at room temperature during heat treatment processes and the use of steam heaters to heat up items was terminated. In addition, indoor air was generally used for turbo compressors, but a trial at using lower temperature outdoor air was implemented and positive results obtained. So all units were modified to use outdoor air, resulting in a reduction in CO2 emissions of 320 tons annually.

In order to raise awareness concerning energy conservation, a wide range of unique ideas have been introduced. The volume of air used is converted into cost and displayed on an electric signboard in real time on the aluminum die casting and forging lines. The manager in charge of facilities has been named the “minister of energy” and his name displayed to raise awareness on a day-to-day basis.

In order to facilitate communication with local residents, 16 neighboring companies established a “No. 4 District Company Liaison Committee,” which acts as a liaison with 12 local neighborhood associations, makes periodic reports, and conducts plant tours. The Kinuura Plant holds plant tours and discloses PRTR information to publicize the plant’s environmental activities and promote understanding of those activities.

In addition, the Kinuura Plant participates frequently in local activities including the region’s largest obon dance festival (one of Japanese summer festivals), a source of great pleasure to the locals. One activity that has been going on for 10 years is the “volunteer farm” using borrowed land near the plant. During the harvest time, persons from local welfare facilities are invited to the volunteer farm to enjoy the organically grown vegetables and a barbecue. Of course, all maintenance work from cultivation to sowing, weeding, and watering is performed by volunteer employees. An employee in the Volunteer Office says, “when we receive a thank you letter, all the labor of weeding in the summer is forgotten. I hope that this type of a project, which makes the local residents happy, will be continued.”