Energy Subcommitteee

The Subcommittee’s efforts are guided by Toyota Industries’ commitment to preventing global warming through the reduction of CO₂ emissions.

Toyota Industries’ Energy Subcommittee was established approximately a decade ago, in 1993. Its role was to develop measures aimed at dealing with critical and challenging environmental issues occurring on a global scale. Recently, it has been reported that certain islands in the South Pacific are being threatened by rising sea levels caused by global warming. In addition, the worldwide move toward ratification of the Kyoto Protocol has placed greater expectations on corporations to shoulder the load of reducing CO₂ emissions. Reducing CO₂ emissions within the context of increased production offers a significant challenge for Toyota Industries. However, we are committed to reaching this goal through a variety of means including the large-scale adoption of energy conservation equipment and the systematic reduction of CO₂ emissions.

Energy Conservation Activities

Toyota Industries’ energy conservation efforts are focused on four major activities that are designed to prevent global warming.

● Medium Range Goals and Major Objectives

Toyota Industries’ business activities affect the environment in a variety of ways through CO₂ emissions caused by energy consumption. Casting and other production processes have a particularly significant environmental impact, but product development and management activities are also sources of energy consumption. Toyota Industries’ Third Environmental Action Plan sets a goal of achieving a 5% reduction in total CO₂ emissions by the end of FY 2005 (based on FY 1990 levels) in order to reduce the company’s environmental impact and prevent global warming. In addition, to pursue this goal through a variety of measures, Toyota Industries set the following major objectives in the Third Environmental Action Plan: (1) reduce the energy loss from product processes; (2) improve power supply methods; (3) improve production equipment; and (4) adopt equipment compatible with alternative energy sources. Toyota Industries is fully committed to carrying out these major objectives through better management and greater awareness toward energy conservation among its employees.

Energy Conservation Activities from the Perspective of CO₂ Emissions

Foundation

Achieve Greater Awareness Toward Energy Conservation Through Employee Education

● FY 2002 Achievements

In FY 2002, Toyota Industries focused its efforts on achieving the company’s short term goal of reducing its total CO₂ emissions to 254.1 kt-CO₂ and its CO₂ emissions on net sales basis to 386 t-CO₂ per billion yen. However, the company was unable to meet its total CO₂ emissions goal for FY 2002 due to increased production and to the start of operations at the company’s new Higashiura Plant.

The company’s total CO₂ emissions for FY 2002 were 269.1 kt-CO₂, or a decrease of 2.8 kt-CO₂ over the previous fiscal year. The decrease in total CO₂ emissions was primarily due to Toyota Industries’ activities to conserve energy, which placed a strong emphasis on improving power supply sources and reducing energy loss from the company’s production lines. On a net sales basis, the company’s CO₂ emissions were 360 t-CO₂ per billion yen, which was a decrease of 32 t-CO₂ per billion yen from FY 2001 and represented a 35% decrease from FY 1990 levels.

Total CO₂ Emissions and CO₂ Emissions Per Net Sales

- Goal set by Third Environmental Action Plan: 259.4 kt-CO₂ in total CO₂ emissions by FY 2005
- CO₂ emissions reduced by 2.8 kt-CO₂ compared with FY 2001
- CO₂ emissions per net sales reduced by 32 t-CO₂ per billion yen compared with FY 2001
- Target set by Third Environmental Action Plan
### Energy Consumption

<table>
<thead>
<tr>
<th>Fuel</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
<th>96</th>
<th>97</th>
<th>98</th>
<th>99</th>
<th>00</th>
<th>01</th>
<th>02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchased Electric Power (MWh)</td>
<td>400,000</td>
<td>350,000</td>
<td>300,000</td>
<td>250,000</td>
<td>200,000</td>
<td>150,000</td>
<td>100,000</td>
<td>50,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City Gas (km³)</td>
<td>500</td>
<td>450</td>
<td>400</td>
<td>350</td>
<td>300</td>
<td>250</td>
<td>200</td>
<td>150</td>
<td>100</td>
<td>50</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Light oil</td>
<td>50,000</td>
<td>45,000</td>
<td>40,000</td>
<td>35,000</td>
<td>30,000</td>
<td>25,000</td>
<td>20,000</td>
<td>15,000</td>
<td>10,000</td>
<td>5,000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Coke (t)</td>
<td>20,000</td>
<td>18,000</td>
<td>16,000</td>
<td>14,000</td>
<td>12,000</td>
<td>10,000</td>
<td>8,000</td>
<td>6,000</td>
<td>4,000</td>
<td>2,000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>LPG (1,000 kg)</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

#### FY 2002 Measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Measure</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce energy loss from product processes</td>
<td>- Discontinue energy plan and reduce power use during non-operation</td>
<td>All plants</td>
</tr>
<tr>
<td></td>
<td>- Reduce air leakage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Selective operation of lighting fixtures</td>
<td></td>
</tr>
<tr>
<td>Improve power supply methods</td>
<td>- Improve efficiency of air compressors</td>
<td>Hekinan Plant</td>
</tr>
<tr>
<td></td>
<td>- Switch energy source for heaters from heavy oil to city gas</td>
<td>Kariya Plant</td>
</tr>
<tr>
<td></td>
<td>- Install demand controlled devices for air-conditioning</td>
<td>Kariya Plant</td>
</tr>
<tr>
<td>Improve production equipment</td>
<td>- Eliminate car wash process from vehicle painting lines</td>
<td>Nagakusa Plant</td>
</tr>
<tr>
<td></td>
<td>- Reduce consumption of cupola coke</td>
<td>Higashichita Plant</td>
</tr>
<tr>
<td>Adopt equipment compatible with alternative energy sources</td>
<td>- Adopt cogeneration systems</td>
<td>Kyowa Plant</td>
</tr>
<tr>
<td></td>
<td>- Adopt micro gas turbine, solar power and wind power systems</td>
<td>Higashiura Plant, e-Lab</td>
</tr>
</tbody>
</table>

#### Adoption of Equipment Compatible with Alternative Energy Sources

**Case Study A  Adoption of Cogeneration System by Kyowa Plant**

The Kyowa Plant is the fifth Toyota Industries facility to adopt a cogeneration system. Cogeneration systems use a clean energy source to supply electric power and steam to production processes. The cogeneration system at the Kyowa Plant uses city gas for its energy source. Furthermore, the advanced cogeneration system in use at the Kyowa Plant is capable of producing a variable output of electric power and steam. The energy efficiency of the system is further enhanced by the use of an air intake cooling system.

The adoption of a cogeneration system at the Kyowa Plant, although increasing the annual consumption of city gas to approximately 13,800 km³, will reduce the plant’s purchased power needs by about 47,000 MWh annually.

Plants with Cogeneration Systems: Kariya, Nagakusa, Takahama, Hekinan, Kyowa

**CO₂ Emission Conversion Factors**

<table>
<thead>
<tr>
<th>Fuel</th>
<th>CO₂ Conversion Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric power</td>
<td>0.3817 kg-CO₂/kWh</td>
</tr>
<tr>
<td>Light oil</td>
<td>2.36 kg-CO₂/kg</td>
</tr>
<tr>
<td>Coke</td>
<td>3.2502 kg-CO₂/kg</td>
</tr>
<tr>
<td>Petroleum</td>
<td>2.7000 kg-CO₂/l</td>
</tr>
<tr>
<td>LPG</td>
<td>3.0094 kg-CO₂/kg</td>
</tr>
<tr>
<td>A heavy oil</td>
<td>2.5308 kg-CO₂/l</td>
</tr>
<tr>
<td>Coke</td>
<td>3.2602 kg-CO₂/kg</td>
</tr>
</tbody>
</table>

*Gas turbine: A system in which compressed air and fuel is burned to produce a high temperature and high pressure gas that drives turbines.
Environmental Conservation Activities

Case Study B  Reduction of Coke Use in Cupola of Higashichita Plant  (Annual CO2 emission reduction: 7.4 kt-CO2)

Toyota Industries’ Higashichita Plant manufactures foundry parts such as engine blocks. Castings are manufactured by placing coke fuel and raw metal such as pig iron in a furnace known as a cupola. Combustion heat is then used to fire the coke and melt the raw metal, which is poured into a mold to create the casting.

At the Higashichita Plant, Toyota Industries made the following improvements to successfully reduce the energy consumption of its casting processes:

1. Reduced the ratio of coke use
2. Reused a greater proportion of raw metal returns* from casting processes
3. Increased the coke particle size

The above improvements have enabled the Higashichita Plant to reduce its coke consumption by 2,300 tons annually.

Case Study C  Elimination of Car Wash Process from Painting Line at Nagakusa Plant  (Annual CO2 emission reduction: 740 t-CO2)

The process of painting an automobile consists of separate undercoating, intermediate coating and top coating processes. After the intermediate coat is applied, a wet sanding process is undertaken to remove any surface irregularities, and then the car is washed. By making various improvements to the intermediate coating process during FY 2002, Toyota Industries’ Nagakusa Plant achieved an intermediate coating quality that effectively eliminated the car wash process in its intermediate painting line. The elimination of this process helped to shorten the overall painting process and is expected to reduce the plant’s CO2 emissions by about 740 t-CO2 annually. Furthermore, the Nagakusa Plant was able to save about 1,200 m2 of floor space by eliminating the car wash process.

Case Study D  Adoption of Demand Controlled Devices at Kariya Plant  (Annual CO2 emission reduction: 55 t-CO2)

Toyota Industries’ Kariya Plant has achieved significant energy savings by instituting appropriate temperature control measures for its air-conditioning systems. During the month of July, the plant’s air-conditioning systems typically account for approximately 10% of the total energy consumed at the plant, with half of this energy consumed by the site’s offices. In July 2002, the Kariya Plant installed a demand controlled device so that it could remotely and centrally manage the temperature settings on air-conditioning systems located throughout its offices. Previously, temperatures had been set according to individual preference.

To further reduce energy consumption, the Kariya Plant used a summer temperature setting that was one degree higher than the previous average summer temperature setting, as well as a winter setting that was one degree lower than the previous average winter temperature. A monitoring device was also installed at the transformer station in order to monitor and forecast the maximum temperature. A monitoring device was also installed at the transformer station in order to monitor and forecast the maximum temperature. A monitoring device was also installed at the transformer station in order to monitor and forecast the maximum temperature.

In the future, Toyota Industries will analyze the data from the use of a demand controlled device at the Kariya Plant in order to explore the possibility of installing similar devices at other plants.

Future Activities

In order to achieve further energy savings, Toyota Industries is committed to implementing the following activities during FY 2003: (1) improve the efficiency of air compressors; (2) adopt solar power generation and rooftop greening at the Obu Plant; and (3) reduce electric power loss during non-operation times.

In addition, Toyota Industries will further enhance its system for measuring energy consumption as well as aggressively work to conserve energy and reduce CO2 emissions throughout its business activities.

*Returns: Excess casting material left over from casting processes.
ST Liquid Crystal Display Corp. (ST-LCD) Adopts Environmentally Friendly Clean Room Ventilation System
—Honored at the Outstanding Energy Conservation Equipment Awards

ST Liquid Crystal Display Corp. is a joint venture between Toyota Industries and Sony Corporation that manufactures liquid crystal displays (LCDs) used in personal digital assistants (PDAs) and video camcorders. In order to manufacture its LCDs, ST-LCD uses clean rooms that consume considerable amounts of energy. In an effort to reduce the energy consumption of its clean rooms, ST-LCD installed three thermal ice storage air-conditioning units and about 500 high-efficiency motors.

In February 2003, ST-LCD was awarded the Prize for Outstanding Performance as part of the Outstanding Energy Conservation Equipment Awards sponsored by the Japan Association of Refrigeration and Air-Conditioning Contractors (JARAC). The prize was awarded in recognition of the efficiency of ST-LCD’s system for maintaining a constant clean room temperature and moisture level. ST-LCD’s system uses elliptical piping rather than conventional round piping in the dry coil units that cool the warm air. The elliptical shape of the pipes results in less air resistance when forcing air through the pipes. Consequently, the circulation fans consume just 83.3 kW per hour, which equates to a reduction of 270 t-CO2 of CO2 emissions annually for the company.

ST-LCD will continue to manufacture LCDs of the highest quality while pursuing environmental activities.

The heated air generated from the production floor passes through the dry coil units, where it is cooled and sent back to the production floor using fans.
Pollution Prevention Subcommittee

The Pollution Prevention Subcommittee is dedicated to reducing the environmental impact of Toyota Industries’ production activities and to maintaining an open dialogue with the local community.

Our main objective is to prevent pollution while managing and reducing the company’s use of substances of concern. In recent years, we have seen the introduction of increasingly stringent regulations designed to protect the environment from the effects of the use of substances of concern. With the introduction of legislation such as Japan’s PRTR Law and the European Union’s end-of-life vehicle (ELV) directive, some products are even prohibited due to their inclusion of such substances.

There is still much that we need to learn about, such as the role of environmental endocrine disruptors in chemical substances. These and other issues serve to remind us of the need to be constantly vigilant about the chemical substances we use.

The Pollution Prevention Subcommittee is committed to further strengthening its efforts to prevent pollution through continued regulatory compliance and the implementation of voluntary measures. We will maintain a stance of full information disclosure and open dialog with the community, so that we may contribute to a sustainable society where humankind and nature can harmoniously coexist.

Chemical Substance Management and Activities to Reduce Substances of Concern

Toyota Industries is making every effort to implement voluntary activities that are designed to prevent pollution and reduce harmful emissions by responding to the global need for chemical substance management.

● Medium Range Goals and Major Objectives

Toyota Industries’ Third Environmental Action Plan sets a medium range goal of achieving a 50% reduction in total emissions of PRTR-designated substances and emissions per net sales of VOCs by FY 2005, compared with FY 1998 levels. The Action Plan also sets forth the major objectives described below.

■ Comprehensive Management of Chemical Substances

Toyota Industries uses a prior assessment system to reduce its environmental impact and reduce various environmental risks. Risk management is practiced by comprehensively managing the adoption of new chemical substances. In addition, Toyota Industries has established its own voluntary control values governing the use of chemical substances, and is further enhancing its system for managing the company’s regulatory compliance.

Chemical Substance Management Overview

![Chemical Substance Management Overview Diagram]

● FY 2002 Achievements

In FY 2002, Toyota Industries’ emissions of PRTR-designated substances stood at 633 tons, while its VOC emissions stood at 3.3 tons per billion yen. As for PRTR-designated substances, the company did not achieve its FY 2002 target due to increased production at the Nagakusa and Kariya Plants (textile machinery plant). Compared with the previous fiscal year, Toyota Industries achieved an 8% decrease in PRTR-designated substances and a 20% decrease in VOC emissions as a result of switching to powder coating and of other efforts to reduce VOCs.

![FY 2002 Achievements Table]

*Figures for VOC emissions per net sales are based on the total net sales from the three business units that emit VOCs.
*Data for compressor division are not included in that of Kariya Plant.
**FY 2002 PRTR-Designated Substance Mass Balance**

<table>
<thead>
<tr>
<th>Input</th>
<th>Water</th>
<th>On-site landfill</th>
<th>Waste</th>
<th>Purification/Filtering</th>
<th>Consumption</th>
<th>Air Release</th>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,481.4 t</td>
<td>0.4 t</td>
<td>60</td>
<td>9</td>
<td>37</td>
<td>1,526</td>
<td>623 t</td>
<td>226</td>
</tr>
</tbody>
</table>

**FY 2002 PRTR-Designated Substance Release and Transfer**

- **Release and Transfer**
  - Air
  - Waste
  - Purification/Filtering
  - On-site landfill

- **PRTR Emissions by Substance**
  - 1,3,5-trimethylbenzene: 8 t
  - Ethylbenzene: 40 t
  - Toluene: 130 t
  - Other: 15 t
  - Xylene: 440 t

**FY 2002 Measures**

<table>
<thead>
<tr>
<th>Description</th>
<th>Measure</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in paint materials</td>
<td>• Switch to powder coating</td>
<td>Takahama Plant</td>
</tr>
<tr>
<td>Change in paint methods</td>
<td>• Switch to single coat application</td>
<td>Takahama Plant</td>
</tr>
<tr>
<td>Ongoing improvements to work procedures</td>
<td>• Reduce coatings and thinner consumption</td>
<td>Nagakusa Plant</td>
</tr>
<tr>
<td></td>
<td>• Improve thinner recovery rate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Switch from thinner cleaning to rag wiping for cleaning of painting machinery</td>
<td></td>
</tr>
</tbody>
</table>

**Case Study Activities at Takahama Plant**

In January 2003, Toyota Industries’ Takahama Plant switched to using powder coating in its painting process for forklift truck masts. The Takahama Plant had previously eliminated undercoating of forklift truck frames and weights in September 2002, as an initial step toward reducing emissions of substances of concern from its painting lines.

**Powder Coating Process**

1. Powder coat application
2. Heating
3. Melting of powder
4. Cooling
5. Deaerating, smoothing and hardening
6. Finished coat

**Elimination of Undercoating**

- **Before**
  - Top coating (for appearance)
  - Undercoating (for rustproofing)
  - Bare metal surface
- **After**
  - Top coating (for both rustproofing and appearance)
  - Bare metal surface

**Future Activities**

In FY 2003, the Kariya Plant (Textile Machinery Division) will adopt powder coating in its paint processes. The Nagakusa plant will switch to water-soluble coatings in order to further reduce its VOC emissions.

**Subsidiary Spotlight**

**VOC Reduction Activities at Overseas Manufacturing Subsidiaries**

European and American restrictions on VOC emissions are stricter than similar regulations in Japan, which directly affects Toyota Industries’ subsidiaries in these regions. Toyota Industries’ overseas manufacturing-related subsidiaries include several firms that use relatively large-scale painting equipment, which cause VOC emissions. This group includes Toyota Industrial Equipment Mfg., Inc. (TIEM), Toyota Industrial Equipment, S.A. (TIESA) and BT Industries Group, which manufacture materials handling equipment. Michigan Automotive Compressor, Inc. (MACI) and Kirloskar Toyoda Textile Machinery Ltd. (KTTM) also use large-scale painting equipment at their facilities. All of these subsidiaries are gradually switching to new coating processes in an effort to reduce their VOC emissions.

<table>
<thead>
<tr>
<th>Subsidiary</th>
<th>Paint Measures</th>
<th>Equipment Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIEM</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>MACI</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>TIESA</td>
<td>○</td>
<td>–</td>
</tr>
<tr>
<td>BT</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>KTTM</td>
<td>–</td>
<td>○</td>
</tr>
</tbody>
</table>
Pollution Prevention

Toyota Industries is striving to prevent pollution by identifying specific areas of environmental impact and establishing voluntary control values.

**Major Objectives**

Toyota Industries is involved in efforts to reduce air pollution caused by pollutants such as nitrogen oxide (NOx), soot and sulfur oxide (SOx) produced by casting furnaces and boilers. The company’s water quality management is focused on preventing water pollution and eutrophication* (nutrient pollution) caused by the discharge of plants’ wastewater into nearby rivers. Toyota Industries is also working to reduce foul odors by reducing its VOC emissions, which are known to release these odors. The company is conducting noise prevention measures by identifying sources of noise and either adopting new equipment or improving existing equipment to reduce noise levels.

**FY 2002 Pollution Prevention Measures**

<table>
<thead>
<tr>
<th>Type</th>
<th>Measure</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air quality management</td>
<td>Reduce SOx by decreasing coke use</td>
<td>Higashita Plant See p.28</td>
</tr>
<tr>
<td>Water quality management</td>
<td>Prevent water pollution by installing a spill barrier</td>
<td>Takamatsu Plant See p.31</td>
</tr>
<tr>
<td>Foul odor prevention</td>
<td>Reduce VOC emissions by switching to powder coating</td>
<td>Obu Plant See p.42</td>
</tr>
<tr>
<td>Noise prevention</td>
<td>Install sound-proofing enclosures</td>
<td>Obu Plant See p.42</td>
</tr>
</tbody>
</table>

**Case Study A: Pollution Prevention Measures at Hekinan Plant**

Toyota Industries’ Hekinan Plant recently constructed a spill barrier around its concentration equipment used to process water-soluble cutting fluids. The purification equipment was located adjacent to a rainwater ditch, with the feed pipes positioned over the ditch. The spill barrier is designed to prevent overflow into the ditch and subsequent water pollution in case of an equipment leak.

**Case Study B: Noise Prevention Measures at Obu Plant**

Toyota Industries’ Obu Plant was fully compliant with regulatory noise level standards before the plant decided on voluntary measures to further limit noise from the plant. The plant installed sound-proofing enclosures for equipment which generated noise.

**Future Activities**

Toyota Industries has established its own procedures governing pollutants that are regulated under the Water Pollution Control Law. The company has created its own set of voluntary control values for water pollutants, which are stricter than regulatory values. Toyota Industries has also laid out appropriate countermeasures to be implemented in the event that voluntary control values are exceeded. In the future, Toyota Industries will seek to further enhance its management system for pollutants and will take additional steps to reduce air pollution, noise pollution and industrial vibration. During FY 2003, the company will establish specific control values to deal with air pollution, noise pollution and industrial vibration levels.

**Reducing Use of HFCs**

Toyota Industries is involved in various activities to collect hydrofluorocarbons (HFCs), substances that have been identified as contributing to global warming.

**Major Objectives**

Toyota Industries currently uses HFC-134a refrigerant in its automobile assembly processes and car air-conditioning compressors. HFC-134a was introduced as an alternative to CFC-12, a substance that damages the earth’s ozone layer. However, HFC-134a has been identified as contributing to global warming. The company uses HFC recovery equipment at its plants to decrease its emissions of HFC-134a.

*For detailed HFC-134a emission levels, see p.44.

**FY 2002 Activities**

In FY 2002, Toyota Industries installed additional HFC collection devices at its Kariya Plant. The new devices are smaller than previous devices used for such recovery.

---

*Eutrophication: Release of substances containing nitrogen and phosphorous into lakes and rivers from household wastewater and industrial wastewater, leading to the multiplication of plankton and microbes that affect water quality.
Toyota Industries uses its own wastewater treatment facilities to treat wastewater produced during manufacturing, before releasing the purified water into rivers and oceans. In FY 2003, Toyota Industries will upgrade the wastewater treatment facility at its Kariya Plant to incorporate a variety of measures designed to conserve energy, reduce industrial waste and minimize environmental risks.

**Environmentally Conscious Wastewater Treatment Facility To Minimize Environmental Risks**

**Wastewater Treatment Process**

1. **Wastewater pond**: 150 m³/h
2. **Storage pond**
3. **Emergency pond**
4. **High-speed sand filter**
5. **High-speed clarifier**
6. **Purification (remove BODs)**
7. **Purification (remove suspended solids and oil)**
8. **Purification (remove CODs and organic matter)**
9. **Water quality check**
10. **Active carbon refiner**
11. **Treated water pond**
12. **Emergency pond**
13. **Dryer**
14. **Dried cake**
15. **Release of treated water**

**Treated water is rerouted to emergency pond if water quality is sub-standard.**

**Energy Conservation Measures**

- Use high efficiency motors and air valves
- Use excess plant steam capacity for drying process

**Waste Reduction Measures**

- Improve drying efficiency for sludge resulting from wastewater treatment
  - 70% reduction in sludge
  - Sludge recycled as cement

**Environmental Risk Management**

1. **Leak Prevention Measures**
   - Installation of 6-sided leak-inspectable ponds to help prevent leakage of wastewater.

2. **Separation of Rainwater and Wastewater**
   - Rainwater and wastewater are kept completely separate for optimal treatment efficiency.

3. **Installation of Emergency Water Tank**
   - Prevents release of sub-standard water.

**6-Sided Leak-Inspectable Ponds**

Each pond is constructed so that it can be inspected from all six sides including the bottom, in order to detect leaking and prevent below-ground release of wastewater.

**Environmental Activities at the Wastewater Treatment Facility of Kariya Plant**

**Spotlight**

**Volume of Wastewater Treatment Capacity**

**Before**

- No Rain
- Rainfall: 0 mm
- Rainwater pipe
- Process pipe
- Rainwater treatment facility
- Rainwater
- Treated water

**After**

- No Rain
- Rainfall: 100 mm
- Rainwater pipe
- Process pipe
- Rainwater treatment facility
- Rainwater
- Treated water

In the previous system, the treatment capacity could have been exceeded during heavy rains, which might have affected the treated water quality. Separating the rainwater from the wastewater enables the facility to maintain the treated water quality at a high level.

**Installation of Emergency Water Tank**

By installing water quality measurement devices in storage ponds, treated water can be diverted to emergency ponds in case of sub-standard water quality, thereby preventing the release of sub-standard water.
Resource Utilization Subcommittee

The Resource Utilization Subcommittee is dedicated to reducing Toyota Industries’ impact on the environment through improved technologies that help the company to better utilize limited resources.

The Subcommittee is guided by a commitment to contributing to a sustainable society through efficient resource utilization, and to reducing the environmental impact of its logistics operations. The Subcommittee has until now focused on efforts to encourage reuse as an important first step towards better resource utilization. In the future, the Subcommittee will focus its efforts on conserving our resources through reduced consumption, which we believe will help Toyota Industries to reduce costs and strengthen the company by creating new business opportunities.

We will continue to aggressively work to solve the challenge of better resource utilization by pursuing solutions from all possible perspectives.

Reducing Industrial Waste

Toyota Industries is committed to achieving its goal of zero emissions of direct landfill waste by FY 2003.

● Medium Range Goals and Major Objectives

To contribute to the building of a sustainable society, Toyota Industries is committed to maximizing recycling of resources and further reducing generated waste.*1

Toyota Industries’ Third Environmental Action Plan sets a medium range goal of achieving zero emissions*2 of direct landfill waste*3 by FY 2003. The company is making every effort to achieve this goal in the next fiscal year. The Third Environmental Action Plan also sets a goal of achieving zero emissions of indirect landfill waste*4 by FY 2005, which the company is pursuing through various measures aimed at the recycling of resources. However, Toyota Industries recognizes that recycling itself causes an environmental impact, and is working towards reducing generation of industrial waste.

Medium Range Plan for Reducing Industrial Waste Generated

● FY 2002 Achievements

For FY 2002, Toyota Industries set annual goals of reducing its direct landfill waste from 10,187 tons to 7,000 tons and its indirect landfill waste from 1,687 tons to 1,154 tons.

In FY 2002, the company generated total waste of 96,692 tons including all forms of waste such as industrial waste, non-industrial waste and reusable materials. Industrial waste accounted for 21,184 tons, of which liability recycling waste*5 totaled 14,535 tons, which is equivalent to a recycling rate*6 of 69%. Direct landfill waste and indirect landfill waste totaled 6,175 tons and 474 tons respectively, which met the short term goals set for FY 2002. Non-industrial waste output came to 1,821 tons at a recycling rate of 93%, which was a 10% improvement over FY 2001 levels.

*1 For definitions of “industrial waste” and “zero emissions,” see the bottom of p.55.

For FY 2002, Toyota Industries set annual goals of reducing its direct landfill waste from 10,187 tons to 7,000 tons and its indirect landfill waste from 1,687 tons to 1,154 tons.

In FY 2002, the company generated total waste of 96,692 tons including all forms of waste such as industrial waste, non-industrial waste and reusable materials. Industrial waste accounted for 21,184 tons, of which liability recycling waste*5 totaled 14,535 tons, which is equivalent to a recycling rate*6 of 69%. Direct landfill waste and indirect landfill waste totaled 6,175 tons and 474 tons respectively, which met the short term goals set for FY 2002. Non-industrial waste output came to 1,821 tons at a recycling rate of 93%, which was a 10% improvement over FY 2001 levels.

*1 Generated waste: The total of landfill waste, industrial waste, municipal waste, reusable materials, and liability recycling waste.
*2 Zero emissions of landfill waste: Defined by Toyota Industries as a 95% or greater reduction in direct landfill waste compared with FY 1998 levels, and a 95% or greater reduction in indirect landfill waste compared with FY 1999 levels.
*3 Direct landfill waste: Industrial waste that is directly disposed in landfills without intermediate treatment such as crushing or incineration.
*4 Indirect landfill waste: Industrial waste that is subjected to intermediate processing such as crushing or incineration before being disposed in landfills.
*5 Liability recycling waste: Waste materials that are recycled for a fee.
*6 Recycling rate: Ratio of industrial waste that is recycled by means of liability recycling.
*7 Final disposal: Total of direct and indirect landfill waste.
Eliminating Direct Landfill Waste

Toyota Industries achieved its goal of zero emissions of direct landfill waste at its Nagakusa Plant in FY 2000, and later at its Kariya Plant, Kyowa Plant, Takahama Plant and Hekinan Plant in FY 2001. The Higashichita Plant and Obu Plant are currently implementing various measures in order to achieve the goal of zero emissions by FY 2003.

Eliminating Indirect Landfill Waste

Toyota Industries’ Nagakusa Plant achieved its goal of zero emissions of indirect landfill waste in FY 2001. The company’s other plants are involved in ongoing efforts to achieve zero emissions of indirect landfill waste through measures such as implementing better waste separation and conducting recycling of waste incinerated by third-party companies. As a result of these efforts, the Kariya Plant and Kyowa Plant successfully achieved the goal of zero emissions of indirect landfill waste in FY 2002. The company’s remaining plants are working to achieve the goal of zero emissions prior to the FY 2005 target date.

Reducing Industrial Waste

Case Study Activities to Reduce Industrial Waste at Hekinan Plant

Toyota Industries’ Hekinan Plant consumes hydraulic oil for its manufacturing equipment. The hydraulic oil must be replaced when it becomes contaminated with water and other impurities. Until recently, the plant had been sending the resulting waste oil to a recycling company for processing. However, the Hekinan Plant recently installed separators to recover hydraulic oil from the waste oil and remove any impurities, which enables the plant to successfully reuse the recycled oil.

Future Activities

Toyota Industries will work to achieve the goal of zero emissions of direct landfill waste at all plants by FY 2003, which will be accomplished by achieving zero emissions at its Obu Plant and Higashichita Plant. The company also plans to achieve zero emissions of indirect landfill waste at its Hekinan Plant and Takahama Plant in FY 2003.
TIBC Corporation Activities to Reduce Industrial Waste

TIBC Corporation, a joint venture between Toyota Industries and Ibiden Co., Ltd., manufactures semiconductor package substrates. The company’s manufacturing processes require the use of strong acids and strong alkalis, which results in significant output of waste liquid that must be treated as special industrial waste.

TIBC has set a goal of achieving a 50% reduction in its output of strong alkalis by FY 2005 and is implementing various measures to achieve this goal. For example, in August 2002, TIBC installed a waste liquid concentrator for its flexible printed circuit (FPC)* substrate manufacturing line that successfully reduced the generation of strong alkalis by 50%. In FY 2003, the company will construct a neutralization processing facility that will further reduce strong alkali generation when combined with the company’s existing waste liquid concentrator.

Tokaiseiki Co., Ltd. New Concentration System Helps to Reduce Mold Release Agent Consumption

Tokaiseiki Co., Ltd. manufactures aluminum die-cast parts for car air-conditioning compressors. Previously, the company used wastewater treatment facilities to treat wastewater produced by its manufacturing processes. However, due to the facility’s proximity to nearby residential neighborhoods and schools, the company decided to decommission the wastewater treatment facility for risk management purposes. In FY 2000, Tokaiseiki installed a new waste oil concentrator that helped the company to drastically reduce the amount of waste oil, which had previously been treated together with wastewater. Consequently, the company reduced waste oil generated from mold release agents and other sources by over 90%, resulting in a decrease from 6,000 tons to just 625 tons in FY 2001. Tokaiseiki also reduced generated industrial waste by 16% in FY 2002 compared with the previous fiscal year.

Nishina Industrial Co., Ltd. Recycling Industrial Waste

Nishina Industrial Co., Ltd. manufactures hydraulic valves and other parts used in industrial equipment such as forklift trucks. In January 2002, the company acquired ISO 14001 certification, which led to a renewed emphasis on promoting environmental activities as a way of improving the company’s management quality. Nishina’s efforts are focused on conserving energy and reducing industrial waste emissions.

Nishina generates large quantities of cutting sludge as a byproduct of its machining operations for parts. Previously, the company had disposed of the cutting sludge, a mixture of cutting oil and sludge, as industrial waste. Starting from FY 2002, Nishina began separating the cutting oil from the cutting sludge mixture using a centrifugal separator, and then reusing the separated oil. Consequently, the company was able to reuse 0.5 tons of cutting oil every month, which is equivalent to 1/8th of its monthly cutting oil needs.

*Flexible Printed Circuit (FPC): Used in manufacturing IC cards.
Reducing Water Consumption

Toyota Industries is taking aggressive steps to reduce its water consumption through efforts such as the elimination of car washing processes and the utilization of rainwater.

● Medium Range Goals and Major Objectives

Toyota Industries is implementing measures to reduce its water consumption in order to conserve water resources and reduce the environmental impact of plant wastewater. The company’s Third Environmental Action Plan sets a medium range goal of achieving a 20% reduction in water consumption in its vehicle manufacturing by FY 2005 (compared with FY 1995 levels), as measured on a volume per vehicle basis. As part of its major objectives, Toyota Industries is committed to both conserving and reusing water resources.

● FY 2002 Achievements

In FY 2002, Toyota Industries focused on achieving its short term goal of reducing the company’s water consumption to 3,258 km³. The company’s total water consumption in FY 2002 was 2,930 km³, which equates to a 19% decrease in water consumption from the previous fiscal year.

Water Consumption

<table>
<thead>
<tr>
<th>Plant</th>
<th>FY 02</th>
<th>FY 01</th>
<th>FY 00</th>
<th>FY 99</th>
<th>FY 98</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hekinan</td>
<td>2,744</td>
<td>3,246</td>
<td>3,296</td>
<td>3,602</td>
<td>2,930</td>
</tr>
<tr>
<td>Takahama</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagakusa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obu</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyowa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kariya</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Excludes data for the Higashichita Plant and Higashiura Plant, which began operations in FY 2001 and FY 2002, respectively.

● FY 2002 Measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Measure</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify and reduce waste</td>
<td>• Identify water leakage points</td>
<td>All plants</td>
</tr>
<tr>
<td></td>
<td>• Implement patrols for processes that use water</td>
<td>Nagakusa Plant</td>
</tr>
<tr>
<td>Improve processes</td>
<td>• Reduce water consumption from plating processes</td>
<td>Kariya Plant</td>
</tr>
<tr>
<td></td>
<td>• Eliminate car washing processes</td>
<td>Nagakusa Plant</td>
</tr>
<tr>
<td>Conserve and reuse</td>
<td>• Convert wastewater for use in cooling towers</td>
<td>Hekinan Plant</td>
</tr>
<tr>
<td></td>
<td>• Utilize rainwater for lawn sprinkling</td>
<td>Higashiura Plant</td>
</tr>
</tbody>
</table>

Case Study Water Conservation Activities at Nagakusa Plant and Higashiura Plant

Toyota Industries’ Nagakusa Plant has successfully eliminated a car washing process that had previously been conducted after the intermediate coating process during painting. This change reduced the plant’s water consumption by 272 liters per vehicle. (For more information, see p.28.) At Toyota Industries’ Higashiura Plant, which began operating in July 2002, a 160 m³ capacity rainwater tank has been installed. Water from this tank is used to supply toilet facilities and provide water used for lawn sprinkling.

Future Activities

Toyota Industries has established a short-term goal of reducing its water consumption by 3% during FY 2003.

Subsidiary Spotlight

Water Conservation Efforts at Overseas Manufacturing-related Subsidiaries

Activities to Promote Water Conservation in Sweden and India

Water is treated as an extremely valuable resource outside Japan, where it is common to collect rainwater for use in lawn sprinkling and other purposes. There is also an increasing emphasis on reusing wastewater resulting from production activities.

BT Industries is located in Sweden and is involved in a variety of activities to conserve water. For example, the company has installed vacuum distillation equipment to purify wastewater used in washing processes. The vacuum distillation equipment enables the company to separate the water and sludge in the wastewater, so that the resulting distilled water can be reused in washing processes.

Water Conservation at BT Industries

At Kirloskar Toyota Textile Machinery Ltd., wastewater from plating processes is reused after being purified in a wastewater treatment facility and an ion-exchange resin process.
Environmental Management

Reducing CO2 Emissions from Logistics Operations

Toyota Industries is making various efforts to increase the efficiency of its logistics operations, including switching to rail transport and sharing its truck capacity.

**Medium Range Goals and Major Objectives**

Toyota Industries recognizes that its transport activities have an impact on the environment as a result of CO2 emissions and other factors. The company’s Third Environmental Action Plan sets a medium range goal of achieving CO2 emissions equivalent to FY 1990 levels by FY 2005. The company’s major objectives are to increase the efficiency of its existing transportation activities and switch to alternative transportation methods.

**FY 2002 Achievements**

For FY 2002, Toyota Industries established a short term goal of reducing its total CO2 emission levels by 10% compared with the previous fiscal year. In FY 2002, the company successfully limited its total CO2 emissions to 6.7 kt-CO2. Toyota Industries achieved this short term goal by improving its load efficiency and rescheduling its truck shipments to reduce the overall number of trips required.

### Case Study A Reducing Truck Shipments

Toyota Industries’ Takahama Plant ships its completed forklift trucks to its regional dealers by truck and to its long-distance dealers by truck or ship. Previously, the Takahama Plant had been using separate truck shipments for each dealer. In FY 2001, the plant established fixed truck routes so that forklift truck shipments could be delivered to several dealers at one time. This helped to reduce the plant’s overall truck shipments.

In FY 2002, the Takahama Plant created additional route variations, bringing the total of fixed truck routes to around 50. Consequently, the plant was able to reduce its CO2 emissions by 241 t-CO2 in FY 2002.

### Case Study B Utilizing Alternative Transportation Methods

In February 2003, Toyota Industries began switching to alternative means of transport for its long distance forklift shipments in Japan. This pilot program involved switching from ship to rail transport over an area that currently stretches from Aichi Prefecture to Kyushu (over 2,500 km). Toyota Industries expects that this pilot program will reduce its CO2 emissions by 96 kg-CO2 per delivery and is planning to switch to rail transport for future shipments to Hokkaido.

### Case Study C Sharing Truck Shipments to Toyota Motor Corporation

Toyota Industries is attempting to optimize the efficiency of its deliveries to Toyota Motor Corporation’s Takaoka Plant. Previously, Hekinan Plant had been scheduling its own independent deliveries to the Takaoka Plant. In November 2002, the Hekinan Plant delivered shipments of goods to the Takaoka Plant that included cargo from other companies. Consequently, the frequency of deliveries to the Takaoka Plant was reduced, which led to a concrete reduction in CO2 emissions.

The Hekinan Plant is also in the process of similarly optimizing its deliveries to other plants owned by Toyota Motor Corporation. These changes are expected to result in a further reduction of 1.9 t-CO2 in CO2 emissions per month.

### Future Activities

In FY 2003, Toyota Industries will further reduce its CO2 emissions by optimizing its transport activities through the initiatives shown above and by switching to alternative transportation methods.

---

**CO2 Emissions from Logistics Operations**

The Third Environmental Action Plan sets a goal of CO2 emissions of 8.2 kt-CO2 by FY 2005.

*Excludes data from the Higashichita Plant, which started operations in FY 2001.

**FY 2002 Measures**

<table>
<thead>
<tr>
<th>Description</th>
<th>Measure</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve transportation</td>
<td>Improve loading efficiency</td>
<td>All plants</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Improve transportation routes</td>
<td></td>
</tr>
<tr>
<td>Change transportation method</td>
<td>Switch from ship to rail transport</td>
<td>Takahama Plant</td>
</tr>
</tbody>
</table>

**Truck Routes**

**Change in Transportation Methods**

Before (ship transport)  
After (rail transport)

**Optimized Deliveries to Takaoka Plant**

Before  
After
In FY 2003, Toyota Industries will continue its efforts to reduce its use of packaging. Measures will include switching from wood to cardboard packaging, expanding its program of using returnable packaging containers in Japan and continued efforts to reuse cardboard packaging.

### Reducing Packaging

Toyota Industries is taking a variety of steps to reduce packaging throughout the company, including the development of reusable packaging methods.

#### ● Medium Range Goals and Major Objectives

Toyota Industries is reducing its packaging consumption used in the transport of products and parts destined for Japan and overseas. The company’s Third Environmental Action Plan sets a goal of achieving a 20% reduction in packaging consumption by FY 2005, compared with FY 1995 levels. Toyota Industries is achieving this goal by constantly making small improvements using the Toyota Production System, which was originally formulated by Toyota Motor Corporation.

#### ● FY 2002 Achievements

In FY 2002, Toyota Industries set a goal of achieving a 10% reduction in packaging consumption compared with the previous fiscal year. The company was unable to meet this objective due to extrinsic factors such as increased production of textile machinery. However, the company reduced its packaging consumption by 49% compared with FY 2001 levels, when measured on a production unit basis.

#### ● FY 2002 Measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Measure</th>
<th>Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change packaging method</td>
<td>• Switch from wood crates to reinforced cardboard boxes</td>
<td>Kariya Plant (Textile Machinery Division)</td>
</tr>
<tr>
<td></td>
<td>• Switch to returnable packaging container</td>
<td>Takahama Plant (Toyota Material Handling Company)</td>
</tr>
<tr>
<td>Improve packaging method</td>
<td>• Reduce materials used in pallets</td>
<td>Kariya Plant (Textile Machinery Division)</td>
</tr>
<tr>
<td></td>
<td>• Switch from cushioning materials to materials made from wood thinnings</td>
<td>Takahama Plant (Toyota Material Handling Company)</td>
</tr>
</tbody>
</table>

#### Case Study: Adoption of Returnable Packaging Containers

As part of its operations, Toyota Industries’ Takahama Plant distributes forklift truck parts to dealers in Japan and overseas. Previously, the Takahama Plant had been using cardboard packaging for its forklift truck parts used in Japan, which required excess packing in the form of cushioning cardboard packaging to protect parts from external forces and wrapping to prevent stacks of boxes from tipping over.

In order to reduce its use of packaging materials, the Takahama Plant began to use returnable packaging containers to transport its forklift truck parts. Consequently, the Takahama Plant reduced its annual purchases of packaging, cushioning materials and wrapping products by 18 tons. The plant is gradually expanding use of its returnable packaging container, which is currently being used by 14 dealers and in 138 locations, primarily in the Chubu region of Japan.

#### Future Activities

In FY 2003, Toyota Industries will continue its efforts to reduce its use of packaging. Measures will include switching from wood to cardboard packaging, expanding its program of using returnable packaging containers in Japan and continued efforts to reuse cardboard packaging.