Iwao Katayama
Managing Director
Chairman,
Energy Subcommittee

Energy Subcommittee

The Subcommittee's efforts are guided by Toyota Industries' commitment to preventing global warming through the reduction of CO_2 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 CO_2 emissions. Reducing CO_2 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 CO_2 emissions.

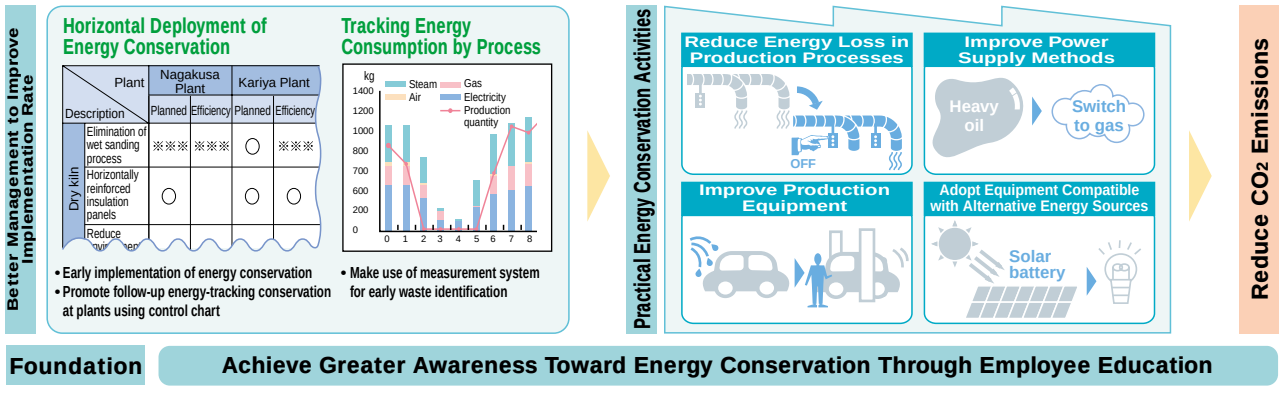
Energy Conservation Activities

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 CO_2 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 CO_2 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 CO_2 Emissions

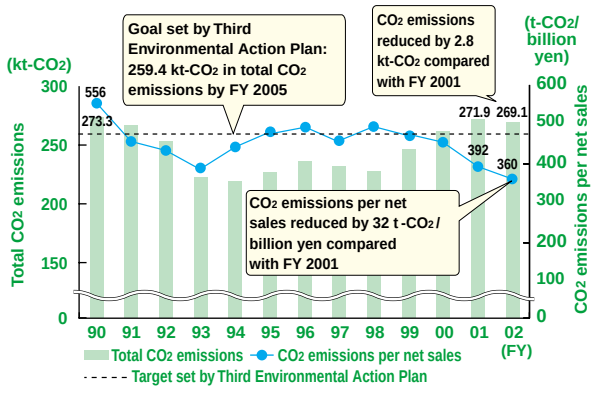


● FY 2002 Achievements

In FY 2002, Toyota Industries focused its efforts on achieving the company's short term goal of reducing its total CO_2 emissions to 254.1 kt-CO_2 and its CO_2 emissions on net sales basis to 386 t-CO_2 per billion yen. However, the company was unable to meet its total CO_2 emissions goal for FY 2002 due to increased production and to the start of operations at the company's new Higashiura Plant.

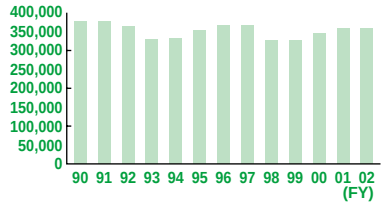
The company's total CO_2 emissions for FY 2002 were 269.1 kt-CO_2, or a decrease of 2.8 kt-CO_2 over the previous fiscal year. The decrease in total CO_2 emissions was primarily due to Toyota Industries' activities to conserve energy, which placed a strong emphasis on improving power supply sources and reducing energy loss from the company's production lines. On a net sales basis, the company's CO_2 emissions were 360 t-CO_2 per billion yen, which was a decrease of 32 t-CO_2 per billion yen from FY 2001 and represented a 35% decrease from FY 1990 levels.

Total CO_2 Emissions and CO_2 Emissions Per Net Sales

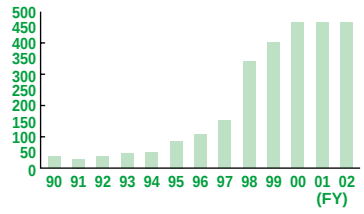


Energy Consumption

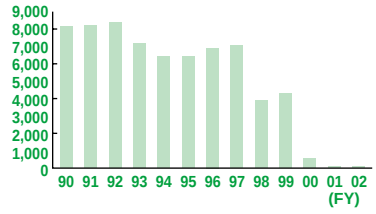
● Purchased Electric Power (MWh)



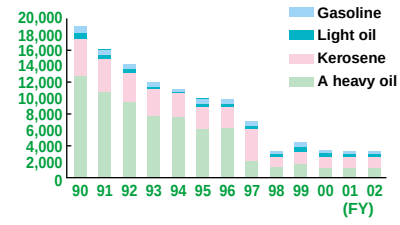
● City Gas (km³)



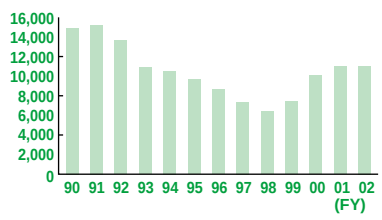
● Liquid Petroleum Gas (1,000 kg)



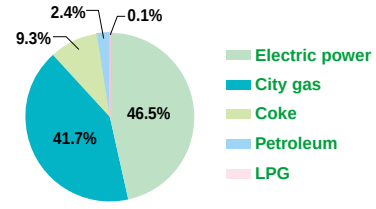
● Petroleum (kℓ)



● Coke (t)



● FY 2002 Energy Sources (In terms of CO_2 Emission)



*CO_2 Emissions: Carbon dioxide produced by energy consumption in the form of electricity, gas or fuel. Includes CO_2 emission data dating back to FY 1990 for Toyota-Sulzer Manufacturing Ltd., a joint venture that became a wholly-owned subsidiary of Toyota Industries in October 2001. Starting from FY 2002, the CO_2 emission conversion factor was changed from a thermal power generation factor to a total power factor.

CO_2 Emission Conversion Factors

Electric power	0.3817kg-CO_2/kWh	Kerosene	2.5308kg-CO_2/l
City gas	2.3576kg-CO_2/m³	Light oil	2.6468kg-CO_2/l
LPG	3.0094kg-CO_2/kg	Gasoline	2.3609kg-CO_2/l
A heavy oil	2.7000kg-CO_2/l	Coke	3.2502kg-CO_2/kg

● FY 2002 Measures

Description	Measure	Plant
Reduce energy loss from product processes	-Discontinue energy plan and reduce power use during non-operation	All plants
	-Reduce air leakage	
	-Selective operation of lighting fixtures	
Improve power supply methods	-Improve efficiency of air compressors	Hekinan Plant
	-Switch energy source for heaters from heavy oil to city gas	Kariya Plant
	-Install demand controlled devices for air-conditioning	Kariya Plant See Case Study D
Improve production equipment	-Eliminate car wash process from vehicle painting lines	Nagakusa Plant See Case Study C
	-Reduce consumption of cupola coke	Higashichita Plant See Case Study B
Adopt equipment compatible with alternative energy sources	-Adopt cogeneration systems	Kyowa Plant See Case Study A
	-Adopt micro gas turbine, solar power and wind power systems	Higashiura Plant, e-Lab See p.29

■ Adoption of Equipment Compatible with Alternative Energy Sources

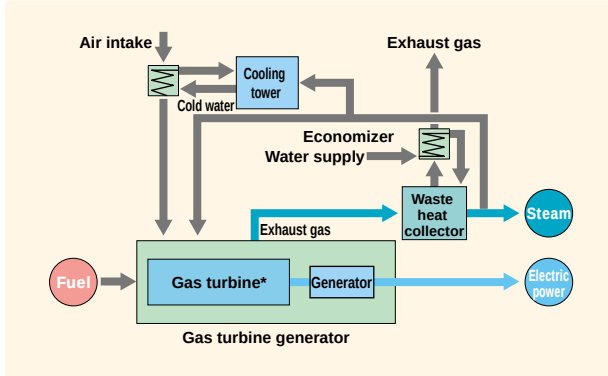
Case Study A Adoption of Cogeneration System by Kyowa Plant (Annual CO_2 emission reduction: 10.5 kt-CO_2)

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

Cogeneration System



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

Case Study B Reduction of Coke Use in Cupola of Higashichita Plant (Annual CO_2 emission reduction: 7.4 kt-CO_2)

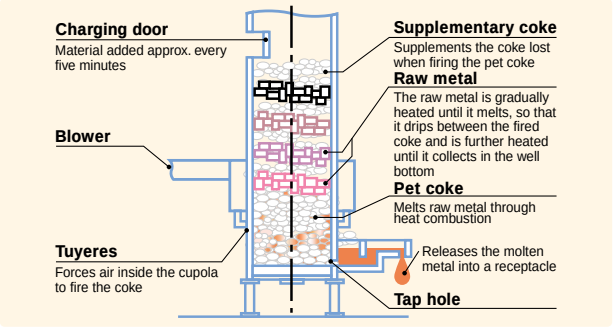
Toyota Industries' Higashichita Plant manufactures foundry parts such as engine blocks. Castings are manufactured by placing coke fuel and raw metal such as pig iron in a furnace known as a cupola. Combustion heat is then used to fire the coke and melt the raw metal, which is poured into a mold to create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

Cupola Construction



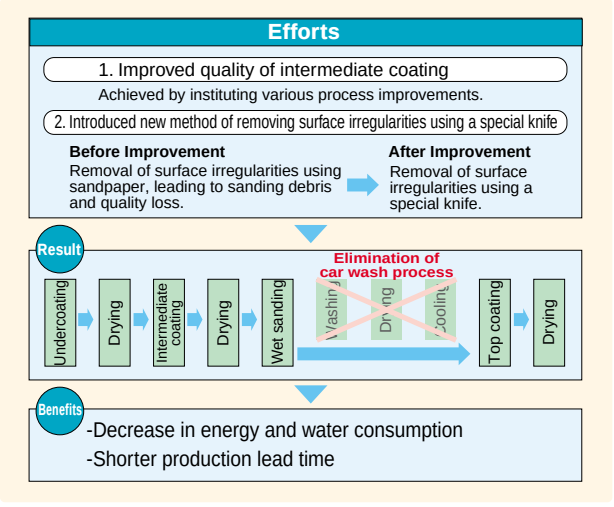
■ Improvements to Production Equipment

Case Study C Elimination of Car Wash Process from Painting Line at Nagakusa Plant (Annual CO_2 emission reduction: 740 t-CO_2)

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 CO_2 emissions by about 740 t-CO_2 annually. Furthermore, the Nagakusa Plant was able to save about 1,200 m^2 of floor space by eliminating the car wash process.

Removal of Surface Irregularities Using a Special Knife in a Wet Sanding Process

Elimination of Car Wash Process



■ Improving Efficiency of Moving Equipment

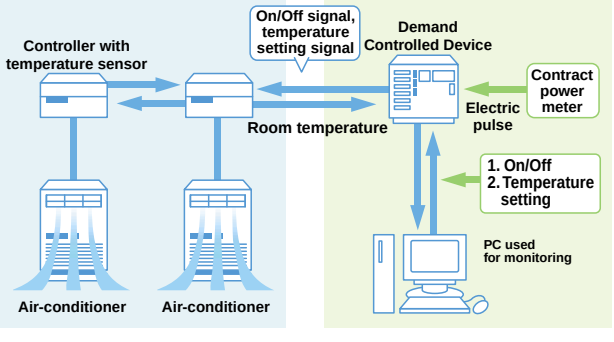
Case Study D Adoption of Demand Controlled Devices at Kariya Plant (Annual CO_2 emission reduction: 55 t-CO_2)

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 that the previous average winter temperature. A monitoring device was also installed at the transformer station in order to monitor and forecast the maximum electric power requirement. This data was used to ensure that the energy consumption from the plant's air-conditioning systems did not exceed the power contract with the electric company.

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.

Demand Controlled Device



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 CO_2 emissions throughout its business activities.

*Returns: Excess casting material left over from casting processes.

Spotlight **Alternative Energy Sources and Greening Measures**

Environmentally Conscious Activities at e-Lab

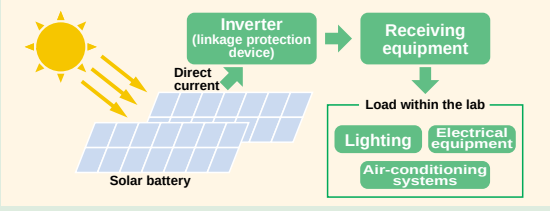
"e-Lab," Toyota Industries' IT research laboratory completed in May 2002, serves as a support organization for the information system division and as the company's R&D facility for information technology. The e-Lab was Toyota Industries' second facility to incorporate a solar power generation system after a similar system was installed at the Higashiura Plant. The power generated by the e-Lab's solar power generation system is used at the facilities.

The e-Lab has also taken steps to conduct greening around the perimeter of the facility and on the bridge that leads to its main entrance. An additional feature of the site is a rooftop garden. The greening efforts are designed to soften the transition between the e-Lab and its surroundings; these stem from the corporate philosophy of contributing to regional living conditions and social prosperity through corporate activities. The e-Lab's greening efforts recently led to the facility being awarded the 10th Aichi Townscape Architectural Award in January 2003, which is given to buildings that serve a major role in the community and contribute to an attractive and unique townscape.

e-Lab's employees also enjoy a working environment that is designed to be environmentally friendly. For example, the e-Lab provides special concentration rooms that are designed to allow employees to work without being disturbed by others, as well as various areas that foster communication between employees. In addition, the architectural layout utilizes a variety of areas that encourage e-Lab's employees to use the facility in different ways.

In August 2002, the e-Lab was awarded the Ministry of Economy, Trade and Industry's Ministerial Award as part of the 15th Nikkei New Office Awards for outstanding new office architecture.

Solar Power Generation System




e-Lab


Rooftop Garden

Affiliate Spotlight

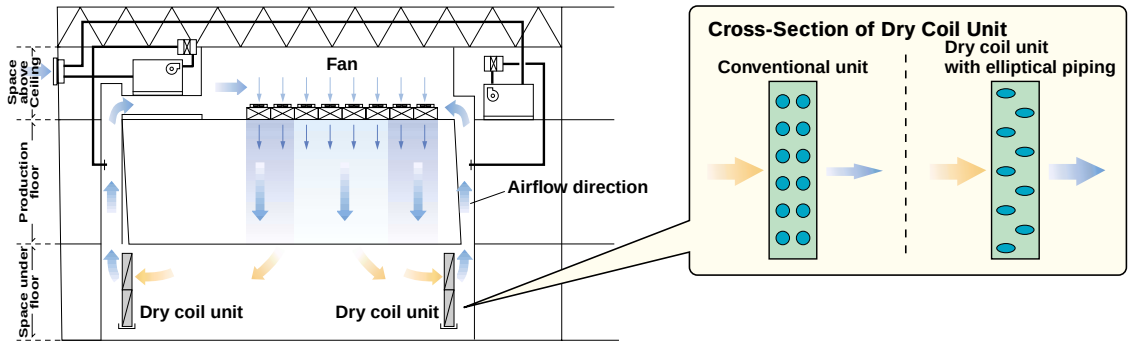
ST Liquid Crystal Display Corp. (ST-LCD) Adopts Environmentally Friendly Clean Room Ventilation System —Honored at the Outstanding Energy Conservation Equipment Awards

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-CO_2 of CO_2 emissions annually for the company.

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

Dry Coil Units Used in Clean Rooms



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.