Special Feature >>> Environmental Design for Lift Trucks

Advancing toward the Realization of People- and Environment-Friendly Logistics

Lift trucks play a crucial role in logistics. As part of our firm commitment to creating environment-friendly logistics, Toyota Industries continues to take on challenges in developing lift trucks that take the environment into account.





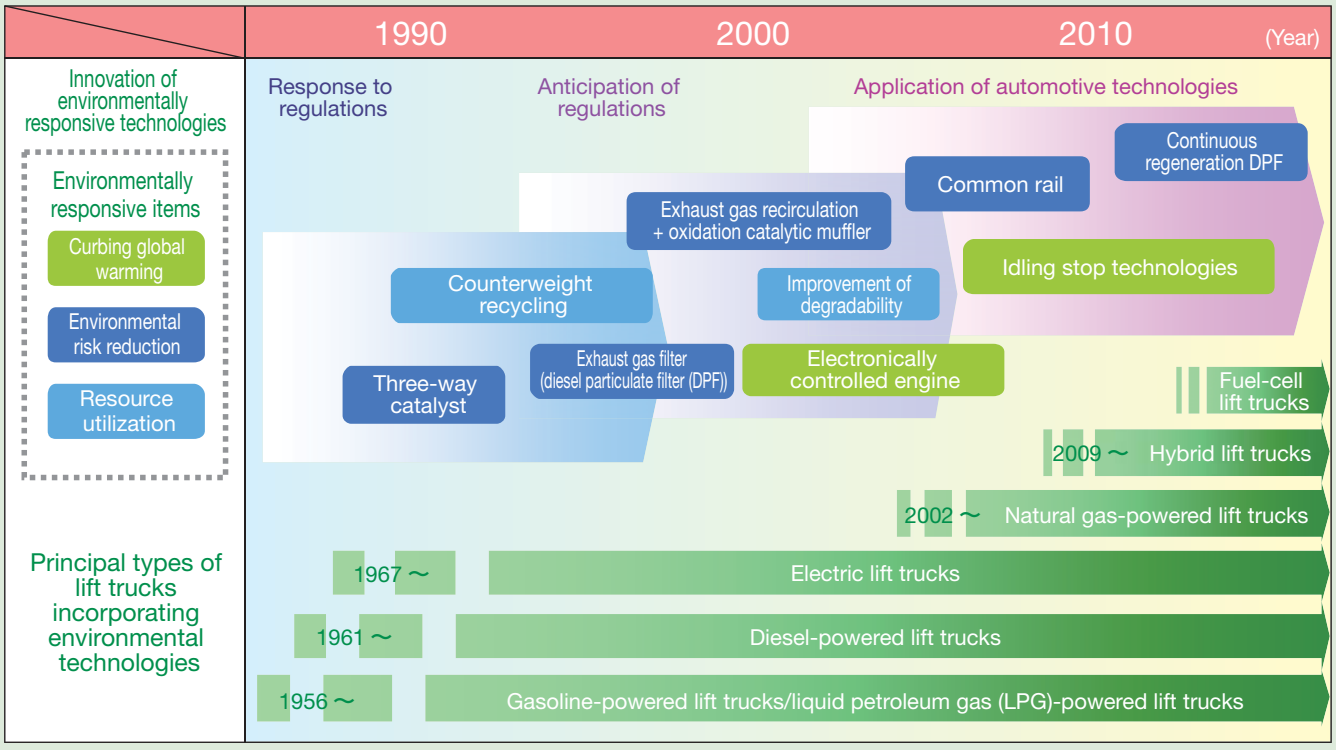
History of Continual Advances in Environmental Technologies for Lift Trucks

As a world-leading company in lift trucks and other materials handling equipment, Toyota Industries develops technologies for creating products with outstanding environmental performance to respond to a host of environmental challenges occurring with the changing of the times.

Toyota Industries commenced production of gasoline-powered lift trucks in 1956. Since then, our environmental technologies for lift trucks, which initially focused on responding to environmental pollution regulations, gradually became more forward-looking in anticipation of regulations for pre-empting various environmental problems. In the 2000s, we expanded the scope of our efforts by actively applying to our lift trucks the leading-edge technologies cultivated in the Automobile Segment as a member of the Toyota Group.

With society confronting numerous environmental issues, Toyota Industries will address environmental needs by pursuing further technological advances in its lift trucks to realize logistics friendly to people, the earth as well as the cargo being handled.

■ History of Toyota Industries' Environmentally Responsive Technologies in Lift Trucks



Interview

Toward an Earth-Friendly Future in Logistics

The Ideal Future of Environmental Technologies for Lift Trucks

We asked Kazuo Ishikawa, assistant general manager of Toyota Material Handling Japan's Technology Research & Development Center, to explain the future of Toyota Industries' environmental initiatives in lift trucks.

Kazuo Ishikawa
Assistant general manager
Technology Research & Development Center
Toyota Material Handling Japan

"I regard environmental initiatives as being equally important as a crucial social responsibility for us as a manufacturer of lift trucks."

Can you tell us about Toyota Industries' environmental initiatives in lift trucks to the present?

Toyota Industries' first environmental initiative in lift trucks was the development of an exhaust-free electric lift truck*1. It was outstanding from the perspective of preserving a healthy natural environment. Besides emitting no exhaust, the electric lift truck was superior to the internal-combustion lift truck in terms of low running costs. However, even though we continued increasing the power of our electric lift trucks with each model change, they were still unable to match the power provided by internal-combustion lift trucks. Because of this power disparity, the electric lift truck was unable to fully satisfy the needs of customers on the basis of usability.

As a solution, we developed the GENEO-B electric lift truck fitted with an AC motor drive system. Launched in 1999, the GENEO-B realized clean emissions, yet achieved high power and high efficiency. As a result, this product earned extensive acclaim from customers as an "electric lift truck capable of replacing internal-combustion lift trucks." I believe the development of the GENEO-B marked the true start of Toyota Industries' proactive approach to developing environmental technologies for lift trucks.

Because lift trucks are used where logistics operations actually take place, safety measures are first and foremost an indispensable prerequisite. At the same time, however, I regard environmental initiatives as being equally important as a crucial social responsibility for us as a manufacturer of lift trucks.

What are some of the trends we can expect in your development of lift trucks over the next several years?

In the immediate future, we plan to roll out a new hybrid lift truck*2 in December 2009.

Regarding the development of internal-combustion lift trucks, we will continue to collaborate with the Automobile Segment on improving fuel efficiency. Nevertheless, internal-combustion lift trucks are powered by burning fossil fuels and this inevitably results in CO_2 and exhaust emissions. From this perspective, it is easy to say that electric lift trucks are the solution. Even though the GENEO-B represented a quantum leap in resolving the major drawback of electric lift trucks, namely, insufficient power, electric lift trucks are still unable to completely deliver power on a par with that of internal-combustion lift trucks. Our answer to this dilemma was the introduction of hybrid lift trucks to sharply raise fuel efficiency while maintaining the same level of power as provided by internal-combustion lift trucks and dramatically reducing CO_2 and exhaust emissions.

Our hybrid lift truck concept model unveiled in 2006 operated using the same type of motor as electric lift trucks. However, the motor fitted in this hybrid delivered higher performance than a regular electric motor and utilized a high-voltage system to boost power. For handling loads, we adopted a parallel method*3 for the engine and electric motor. By fitting the hybrid lift truck with a one-class-smaller engine in terms of exhaust emissions, we improved fuel efficiency, while the motor helped compensate for insufficient engine power when lifting loads. By taking this approach, we obtained the same level of power as provided by internal-combustion lift trucks.

Over the immediate term, a major theme will be to create the most optimal type of hybrid lift trucks by drawing on the extensive power electronics technologies cultivated through our long years of involvement in the development of electric lift trucks.

Hybrid lift truck
Concept model unveiled in 2006

*1: To maintain clean environments inside warehouses and at food processing plants, Toyota Industries was an early forerunner in developing and introducing electric lift trucks and has worked to promote the widespread use of these vehicles. In 2008, Toyota Industries' sales of electric lift trucks in Japan reached over 50% of total sales.
*2: In December 2009, Toyota Industries will launch sales in Japan of the 3.5-ton GENEO-HYBRID, which combines a diesel engine, electric motor and battery.
*3: Parallel method: A method for using the power of both the engine and the electric motor. Alternatively, with the series method, the engine generates power only while the electric motor provides the drive power.

What do you think lift trucks will look like a little farther down the road?

From a more long-term perspective, I believe that lift trucks should head toward full electrification.

At present, we are naturally pursuing high performance and high efficiency for each individual component, such as controllers and motors for electric lift trucks. Although we are attaining progress in these efforts, I believe we can further improve efficiency and reduce CO_2 emissions by transitioning completely to electric power, including for lifting and steering currently powered hydraulically. The main issue will be choosing the appropriate power source. In countries with low CO_2 emissions volume per units of sales, battery recharging can serve as a power source. However, in countries with high CO_2 emissions volume per units of sales that primarily rely on coal-fired electric power, the use of battery recharging as a power source is unlikely to significantly reduce CO_2 emissions. I believe it is better for such countries to consider fuel cells as a power source.

Additionally, some of our customers operate lift trucks around the clock. At present, these customers must recharge lift truck batteries, a process that requires long time periods, and use lift trucks while continually interchanging batteries. Under such conditions, I believe there are two viable choices for lowering running costs, namely, either rely on fast recharging of batteries or use fuel cells depending on the number of lift trucks in operation.

Because both choices have advantages, Toyota Industries must be able to offer customers proposals for lift trucks that operate on optimal types of energy. In doing so, we need to evaluate a broad range of factors such as whether a particular power source is suited to the scale of the customer's operations, length of operating times and CO_2 emissions volume per units of sales, as well as consider such questions as what is the best power source or whether fuel-cell trucks should be used from the outset.

Could you briefly touch upon any other key area besides power source measures?

One important issue is reducing energy consumption during the horizontal—forward and backward—operation of lift trucks. Lift trucks are equipped with a counterweight to maintain balance with the load being handled. Other than the actual loads handled, the counterweight is one of the heaviest parts of a lift truck and this weight leads to huge energy losses during horizontal transportation. One solution envisioned is dividing the process into two separate operations, specifically, loading and unloading as one operation and horizontal transportation as another. However, lift trucks are extremely useful precisely because these vehicles can perform both types of operations and are thus ideal for use at numerous logistics sites. Given these advantages, it is unlikely that demand for lift trucks will ever disappear. To reduce energy consumption during horizontal operation, I believe that several measures will need to be taken. These include reevaluating the actual structure and configuration of lift trucks to realize weight reductions.

Finally, what role do you envision for Toyota Industries in the future?

One of Toyota Industries' strengths is its comprehensive involvement in virtually all aspects of logistics. While taking an overview of the entire logistics process, we are able to orient the direction of our development from the perspective of the optimal types of lift trucks for each logistics operation. I believe our role in lift truck development is to respond to the logistics needs of all customers worldwide and propose the best energy mix from the dual perspectives of power sources and forms of transportation.

"I believe our role in lift truck development is to respond to the logistics needs of all customers worldwide and propose the best energy mix from the dual perspectives of power sources and forms of transportation."

Topics

Takahama Plant Showroom Introduces Toyota Material Handling Group (TMHG) Products

A showroom was opened at the Takahama Plant to introduce customers to Toyota Industries' industrial vehicles, including lift trucks and hybrid lift trucks, as well as materials handling equipment such as automated storage and retrieval systems. Also featured are a variety of displays, including a video presentation that covers the history of our products and introduces current products. These displays provide customers with a deeper understanding of our industrial vehicles and other materials handling equipment.

The Takahama Plant's TMHG Technical Center, which houses the showroom, was built in fiscal 2008. The center has adopted a host of eco-friendly measures to curb global warming, including the use of solar panels, rooftop greenery and optical duct systems.

Showroom interior at the Takahama Plant

Global Environmental Commitment

The Toyota Industries Group will contribute to the compatibility of environmental conservation and economic growth throughout its wide range of business activities, including automobile, materials handling equipment, logistics and electronics.

Basic Policy

- The Toyota Industries Group will continue to set challenging targets aimed at further reducing the environmental impact of its business activities, listening carefully to voices of its stakeholders such as customers, and acting in compliance with the letter and spirit of laws and regulations.
- The Toyota Industries Group will continuously improve its environmental management, placing environmental activities among its highest priorities. In particular, the Company will give priority to the following items.

Curb global warming
Aiming to reduce energy consumption and the output of greenhouse gases through the entire lifecycle of its products, services and production activities
Use resources more efficiently
Utilizing raw materials, water and other resources efficiently while working to reduce, reuse and recycle waste products
Reduce environmental risk factors
Reducing the use and output of substances of concern while evaluating environmental risk factors at the planning stage of business activity in order to prevent pollution

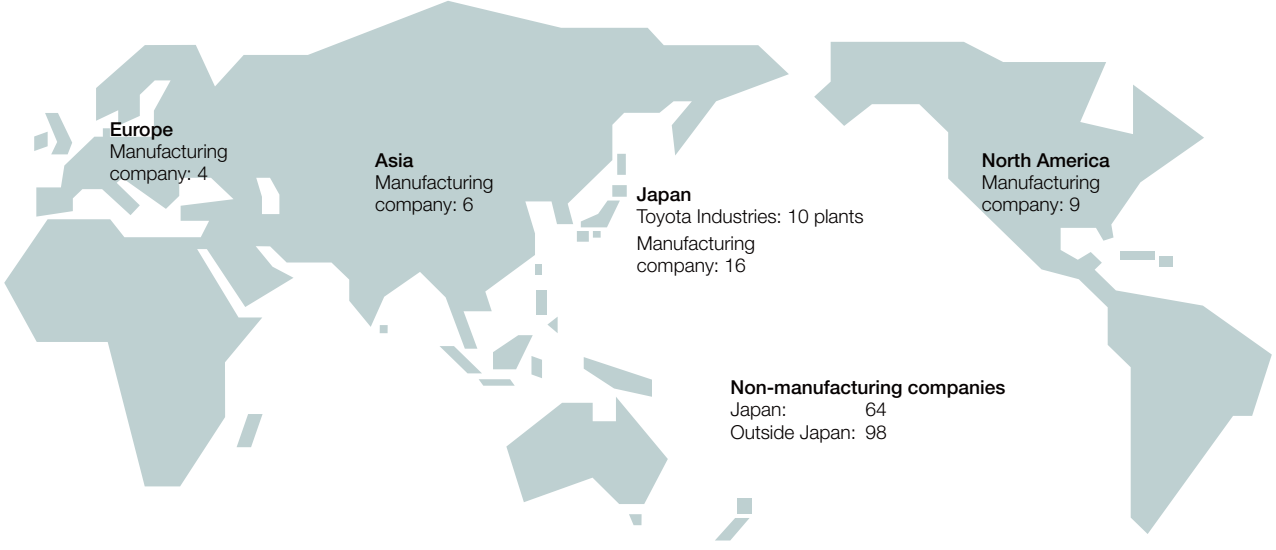
- The Toyota Industries Group will aim to foster greater communication and teamwork within a wide range of partnerships, including those with customers and suppliers, in order to promote sustainable management of the environment. In addition, the Toyota Industries Group will act as an upstanding corporate citizen, taking an active part in the planning of activities that contribute to various regional communities as well as to our global society.

July 2005

Tetsuro Toyoda
President

Scope of Group-Wide Environmental Management

(As of March 31, 2009)



Environmental Management

Environmental Management System

Toyota Industries uses an ISO 14001-based environmental management system (EMS) as an effective tool in its efforts to promote environmental management and fulfill its corporate social responsibility. To further raise the level of its environmental management, in fiscal 2008 Toyota Industries reorganized its EMS previously operated independently at respective plants and began operating a Company-wide EMS, with the president at the top. In fiscal 2009, the Company-wide EMS underwent an external audit for ISO 14001 certification and successfully obtained integrated certification.

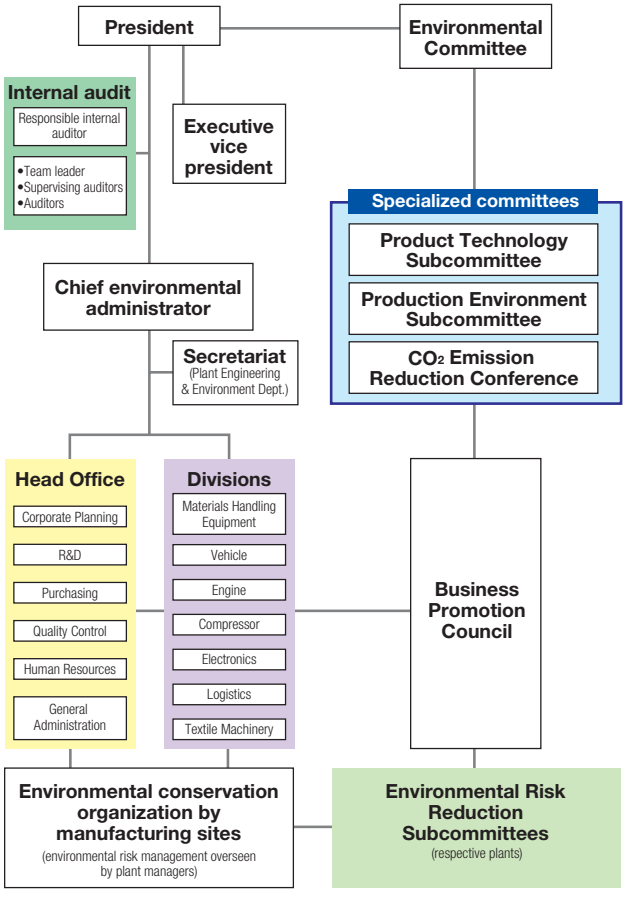
We intend to strengthen our environmental activities and accelerate decision-making for environmental responses by operating our Company-wide EMS in accordance with our business formats. At the same time, we plan to formulate a medium- and long-term vision for this system and promote various initiatives to realize ideal environmental management.

Establishment of the Company-Wide CO_2 Emission Reduction Conference

Toyota Industries' activities to curb global warming in production activities have traditionally focused on resource utilization and reducing risk in addition to determining policies, targets and activity plans at meetings of the Production Environment Subcommittee.

Nevertheless, with the increased urgency and importance of CO_2 reduction activities to attain the targets of the Kyoto Protocol, Toyota Industries inaugurated the Company-wide CO_2 Emission Reduction Conference, a specialized committee in activities to reduce CO_2 emissions with the aim of further bolstering our initiatives in this area. The Business Division Working Group, set up as a subordinate organization under the newly established committee, will devise and implement measures for attaining the respective fiscal year targets for each business division and share related information across the Company. This approach will maximize the effectiveness of environmental activities in vigorously promoting CO_2 reductions.

Environmental Management Structure



Environmental Education

Based on its belief that manufacturing starts with nurturing excellent personnel, Toyota Industries regards human resources development as one of its most important management issues, and thus actively provides environmental education programs and carries out enlightenment activities for its employees. Toyota Industries has clarified the environmental-related knowledge and capabilities required for each job position and rank, and accordingly, is building an environmental education program. Specifically, we offer rank-based environmental education, introductory courses for environmental management and environmental audits as well as environmental product education.

Based on the latest environmental trends and effectiveness of education, we intend to review our environmental education programs to continuously nurture personnel well-versed in environmental affairs.

Environmental Audits

Toyota Industries implements annual internal environmental audits as well as external audits carried out by an independent third-party institute. We utilize the results of these audits in our Company-wide EMS in working to reduce environmental risk and continually improve environmental performance. To ensure the independence and high quality of our internal audits, we have established an internal audit organization in which the senior managing director, who is appointed by the president as the person in charge of audits, selects a team leader. The organization is also comprised of auditors selected from each business division. In fiscal 2009, we conducted the second internal audits since integrating our Company-wide EMS, and the average number of citations declined from 1.98 to 1.03. This decline underscores the effectiveness of improvement activities in response to citations and recommendations for improvement made through previous audits. These recommendations that benefited management were reported to the president as audit results and then underwent a management review*.

The external audit undertaken in fiscal 2009 for integrated ISO 14001 certification recognized improvements in the quality of the content of our internal audits. We are now implementing corrective actions and making further improvements for five cases of minor non-conformance cited during that audit.

* Management review: To ensure the appropriateness, adequacy and effectiveness of the Company-wide EMS, the president receives a report on the status of environmental activities by the Environmental Committee once a year, and then evaluates the need for changes and improvements and gives directions on measures to be taken.

Topics

Opening an Environmental Dojo at the Takahama Plant

Based on the concept of establishing a "place where each individual attains a self-awareness of the ideas embodied in the Global Environmental Commitment," we opened the "environmental dojo" at the Takahama Plant. The dojo has seven theme-based areas, including the "global environment," "energy conservation," "eco-product design" and "what I can do" areas and serves as a venue for enabling Toyota Industries' specific environmental activities to be experienced firsthand.

Business Activities and Their Environmental Impact

As a manufacturer of a wide variety of products, including automobiles, car air-conditioning compressors, lift trucks and textile machinery, Toyota Industries strives to understand the environmental impact of our products across their entire lifecycle from parts procurement through to production and disposal.

The most notable environmental impacts generated by Toyota Industries' operations include global warming caused by the use of energy and greenhouse gas emissions; resource depletion from the use of raw materials; the atmospheric impact of using chemical substances; and the impact of industrial wastewater on public waterways. Toyota Industries is systematically striving to reduce these kinds of environmental impacts.

CO_2 Emission Conversion Factors

Contents	Conversion factor (energy-derived)	Conversion factor (logistics-derived)
Electricity (*1)	0.3817kg-CO_2/kWh	–
City gas	2.3576kg-CO_2/m^3	–
LPG	3.0094kg-CO_2/kg	3.00kg-CO_2/l
A heavy oil	2.7000kg-CO_2/l	–
Kerosene	2.5308kg-CO_2/l	–
Coke	3.2502kg-CO_2/kg	–
Gasoline	2.3609kg-CO_2/l	2.32kg-CO_2/kWh
Light oil	2.6468kg-CO_2/l	2.62kg-CO_2/kg
LNG	2.790kg-CO_2/kg	–
Propylene	3.141kg-CO_2/kg	–

*1: The electricity conversion factor in the table is applied to companies in Japan. Overseas companies use factors publicly announced in each region.

Environmental Impact Flow

INPUT

◆Energy

Total consumption 6,977TJ*2

Electricity	760,931MWh
City gas	89,702km^{3}N
LPG	1,846t
A heavy oil	364kl
Kerosene	244kl
Coke	4,825t
Petroleum coke	341t
Anthracite coal	1,026t
Gasoline	520kl
Light oil	3,666kl
LNG	687t
Propylene	11t

*2: Terajoule is a unit used to measure heat. 1 TJ = 10^{12} joules

◆Raw Materials

Raw materials consumption 434,558t

Metals	431,579t
Non-metals	2,978t

◆Water

Water consumption 4,294km^3

◆Chemical Substances

PRTR law*3 designated substances (Japan only) 2,589t

*3: Short for Pollutant Release and Transfer Register, the PRTR law is a scheme whereby businesses measure the release and transfer of PRTR-designated pollutants and report their performance to the government. The government then compiles this data and releases it to the public.

◆Packaging Materials

Packaging materials consumption 5,693t

R&D/Design

Procurement

Production

Transportation/Sales

Usage

Recovery/Recycling

OUTPUT

◆Into the Air

Greenhouse gas emissions 570,866t-CO_2

CO_2	566,250t-CO_2
Other greenhouse gases	4,616t-CO_2
SOx (Sulfur oxide)	526kg
NOx (Nitrogen oxide)	146t
VOC (Volatile organic compound)	1,914t

◆Chemical Substances

Emissions (Japan only)	472t
Transfers (Japan only)	183t

◆Waste

Waste generation (Japan only) 113,472t

◆Into Waterways

Water pollutants (Japan only) 26t

Wastewater discharge (Japan only) 2,676km^3

◆CO_2 from Logistics

CO_2 emissions from logistics operations 57,829t-CO_2

Targets and Results of the Fourth Environmental Action Plan

Outline of the Fourth Environmental Action Plan

As one of Toyota Industries' major approaches to the environment, we devise and implement a five-year Environmental Action Plan. In the Fourth Environmental Action Plan (fiscal 2007 to fiscal 2011), curbing global warming, resource utilization, reducing environmental risk factors and consolidated management are positioned as the key areas of the Toyota Industries Group's environmental activities. Target management is measured by the concept of "eco-efficiency," which quantifies the effectiveness of our environmental activities.

Calculation Formula

Product

$$\text{Eco-efficiency} = \frac{\text{Product functions}}{\text{Environmental impact of products}}$$

Production

$$\text{Production efficiency} = \frac{\text{Production indicator (Net sales or production volume, etc.)}}{\text{Environmental impact of production activities}}$$

$$\text{Eco-efficiency} = \frac{\text{Production efficiency in subject year}}{\text{Production efficiency in base year}}$$

Progress of the Fourth Environmental Action Plan (Product-Related)

Action Policies		Specific Actions	FY2009 Achievements
Curbing Global Warming → P25	Automobile-related products: Promote the development of technologies that achieve the best fuel-efficiency performance in each country and region	Develop high-efficiency car air-conditioning compressors	Developed new continuous variable-displacement compressors
	Non-automobile related products: Promote the development of technologies that achieve the best energy efficiency in the industry	Develop industry-leading, energy-saving technologies for textile machinery	Implemented baseline assessment for reducing air-jet loom's air consumption
	Promote the development of devices for clean energy vehicles	Further improve the performance of devices for hybrid vehicles	Developed compact in-vehicle DC-AC inverters
	Reduce greenhouse gases throughout products' lifecycles	Develop products with high eco-efficiency	Developed new electrically driven compressors
Resource Utilization → P28	Further promote the use of designs that are based on the Designs for Recycling (DfR) concept	Improve durability of lift trucks	Improved battery life and durability of parts
Reducing Environmental Risk Factors → P29	Promote stricter control of and further reduction in the use of substances of concern	Establish chemical substances control system	Commenced full implementation of chemical substances control system
	Reduce exhaust emissions to improve air quality in urban areas in all countries and regions	Introduce top-performing, low-emissions lift trucks	Complied with domestic emissions regulations for lift trucks

Progress of the Fourth Environmental Action Plan (Production-Related)

Action Policies		Specific Actions	Control Items (FY2011 Target)	FY2009 Achievements		
				Target	Result	Assessment
Curbing Global Warming → P26	Promote energy reduction and energy conservation through innovative production technologies	Reduce CO_2 from energy use •Streamline production processes •Optimize supplied energy •Promote introduction of alternative energy sources	Non-consolidated Energy-derived CO_2 eco-efficiency: 1.30 (vs FY1991)	1.42	1.40	×
			Consolidated Energy-derived CO_2 eco-efficiency: 1.10 (vs FY2004)	1.10	1.07	×
	Reduce CO_2 emissions through green logistics	•Promote modal shift	—	1.02	1.08	○
Resource Utilization → P28	Enhance resource productivity	Resources •Reduce the volume of discarded materials by taking action at the source, such as improving yields and other measures	Non-consolidated External disposal eco-efficiency: 1.05 (vs FY2004)	1.06	1.08	○
	Reduce use of groundwater	•Promote recycling of wastewater •Reduce use of water	Non-consolidated Groundwater use: 50% reduction (vs FY2004) (Total volume is indicated in parentheses; unit: km^3)	58% reduction (531)	72% reduction (356)	○
	Reduce total environmental impacts of waste disposal	•Eliminate landfill disposal at all consolidated manufacturing companies	Manufacturing sites in Japan Landfill volume: less than 1% (vs FY1999) (Total volume is indicated in parentheses; unit: t)	0.74% (74)	0.22% (22)	○
Reducing Environmental Risk Factors → P29	Minimize environmental risks	•Establish environmental risk assessment systems at the planning stage (incorporate measures to reduce environmental impacts in the business planning stage)	•Strengthen activities to reduce environmental abnormalities/claims through reciprocal patrols among plants		Conducted 21 plant inspections	○
	Further reduce emissions of substances of concern	•Reduce emissions of air pollutants, including volatile organic compounds (VOCs) •Reduce emissions of water contaminants	Non-consolidated Environmental impact: 10% reduction (vs FY2004)	20% reduction	40% reduction	○
			Manufacturing sites in Japan Environmental impact: 5% reduction (vs FY2004)	22% reduction	45% reduction	○

Curbing Global Warming

Approach to Curbing Global Warming

The year 2008 marked the start of the commitment period to reduce greenhouse gas emissions obligated by the Kyoto Protocol, an international framework for curbing global warming, amid the emergence of various problems worldwide attributed to global warming.

In the international community, the focus of discussion is now shifting toward the establishment of a framework from 2013, following the end of the commitment period of the Kyoto Protocol, and movements to formulate measures to curb global warming are gaining momentum. As these developments unfold, CO_2 emissions in Japan during fiscal 2008 rose 8.7% over levels for fiscal 1991, the base year for the Kyoto Protocol, highlighting the need for further emission reduction efforts for Japan to attain its targets.

Toyota Industries has designated the curbing of global warming as one of its most urgent management tasks to help attain the Kyoto Protocol targets and to realize a low-carbon society. All companies in the Group are committed to working together in continuing proactive initiatives for curbing global warming by developing technologies that take the environment into account, innovating production technologies for energy conservation and promoting green logistics.

Products Inauguration of the Study for Curbing Global Warming

Toyota Industries' principal businesses are broadly classified into the Automobile, Materials Handling Equipment, Logistics and Textile Machinery businesses. Products developed and manufactured in these businesses, such as vehicles, lift trucks and textile machinery, are used widely throughout the world. At the same time, however, Toyota Industries' products either directly or indirectly emit CO_2, mainly during the usage stage. Nonetheless, Toyota Industries foresees difficulties in achieving further large reductions in CO_2 emissions by relying on conventional product development methods.

In view of this situation, in fiscal 2009 we initiated the Study for Curbing Global Warming, which began to carry out various activities for reevaluating our businesses within the context of an ideal society in the future. The research findings will be reflected in our Fifth Environmental Action Plan from fiscal 2012.

Products 10SR Series of Rotary Valve Compressors Contribute to the Curbing of Global Warming

Toyota Industries' 10SR series of rotary valve compressors has attained a large reduction in power consumption by utilizing a rotary valve in the intake mechanism. Integrating an oil-separating function allows a one-rank reduction in compressor capacity while also realizing more compact and lightweight compressors. This technology is making major contributions to enhancing vehicle fuel efficiency and reducing CO_2 emissions.

10SR series of rotary valve compressors

Products Scope of Environmentally Friendly Product Certification System Expanded to Cover All Group Products

In December 2006, we introduced our proprietary Environmentally Friendly Product Certification System, with six products certified so far. Based on the International Standards Organization (ISO) Type II environmental labeling standard (ISO 14021), this system comprehensively evaluates our activities in terms of curbing global warming, resource utilization and reduction in environmental risk.

Under the Type II environmental labeling standard, ISO does not require independent third-party certification (only self-declaration by the enterprise). To create an even more reliable program, however, Toyota Industries has its self-assessment confirmed by an independent third party. In recognition of this decision, in fiscal 2008 Toyota Industries received the Eco-Efficiency Award 2007*1 from the Japan Forum on Eco-Efficiency.

To step up the promotion of environmentally friendly products, in fiscal 2009 we modified stipulations and expanded the system's scope of coverage to all Group products. In April 2009, the BT Lifter hand pallet truck, one of the Materials Handling Equipment Business's warehouse trucks, became the first environmentally friendly product certified under the expanded scope of coverage. The BT Lifter is more compact and lighter than previous models and has a 1.9 CO_2 factor*2 during the product lifecycle.

*1: This is a program for recognizing the activities of companies making continuous efforts to enhance socio-economic activities while reducing the environmental load.
*2: CO_2 factor: Ratio that quantitatively assesses how much a newly developed product's eco-efficiency has improved compared with that of the base product with regards to reducing CO_2 emissions during its lifecycle

CO_2 factor	1.9

BT Lifter LHM230

Certificate of Environmentally Friendly Product

Topics

10SR Series of Rotary Valve Compressors Earn the Bronze Prize for the Aichi Environmental Awards

Toyota Industries earned the Bronze Prize for the Aichi Environmental Awards for its 10SR series of rotary valve compressors. The award was presented in recognition of Toyota Industries' contributions to reducing the environmental load from vehicles by developing and mass-producing compact, lightweight car air-conditioning compressors that consume little power and raise the fuel efficiency of vehicles.

Curbing Global Warming

Production Reducing Energy Usage to Curb CO_2 Emissions

To combat global warming, Toyota Industries focuses on realizing energy reductions and conservation via innovations in production technology and promoting measures to curb global warming in its Fourth Environmental Action Plan.

In fiscal 2009, Toyota Industries carried out activities on a non-consolidated and consolidated basis aimed at attaining targets equivalent to or higher than those in the Fourth Environmental Action Plan.

On a non-consolidated basis, Toyota Industries set the target of raising eco-efficiency 42% over fiscal 1991 levels. Specific measures toward achieving this objective included increasing energy efficiency through the electrification of heat sources for air conditioning at the Kariya Plant and effectively utilizing steam from cogeneration at the Obu Plant.

On a consolidated basis, Toyota Industries established the target of raising eco-efficiency 10% over fiscal 2004 levels and promoted such initiatives as implementing measures against air leakages at all consolidated companies and conducting energy audits.

With the across-the-board collaboration of departments that manage the supply of energy and production sites that use this energy, Toyota Industries continued to implement proactive initiatives that led to a 40,000-ton reduction in CO_2 emissions on a non-consolidated basis in fiscal 2009.

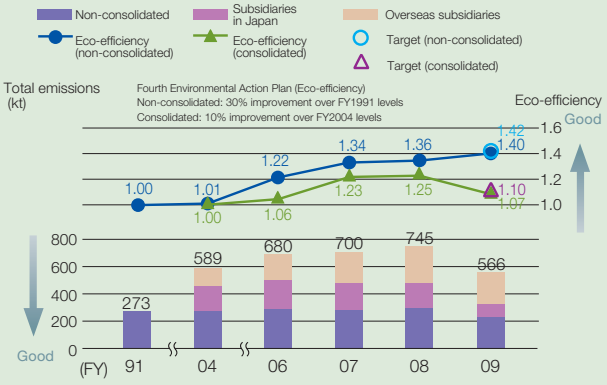
Nevertheless, although we attained a 40% improvement in eco-efficiency on a non-consolidated basis over fiscal 1991 levels and a 7% improvement on a consolidated basis over fiscal 2004 levels, these figures fell short of the targets set for fiscal 2009 due to the rapid deterioration of the business environment. In working to attain even higher targets in the future, Toyota Industries will focus on promoting energy reductions and conservation measures.

Production Reducing CO_2 Emissions from Transportation

Reducing CO_2 emissions during product shipping and all other phases of logistics is also another crucial issue. Toyota Industries is currently collaborating with transportation operators to reduce CO_2 emissions during the logistics process.

In fiscal 2009, we carried out activities aimed at improving eco-efficiency by 2% over fiscal 2007 levels on a non-consolidated basis by promoting measures such as expanding the rail transport of completed lift trucks in the Materials Handling Equipment Business and improving transportation routes in the Logistics Business. As a result, we dramatically exceeded our target to achieve an 8% improvement over fiscal 2007 levels.

Energy-Derived CO_2 Emissions & Eco-Efficiency



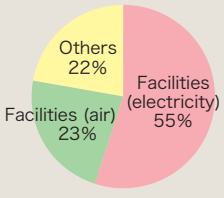
Topics

Building a Model Production Line that Utilizes Energy-Saving Devices for Reducing CO_2 Emissions

For many years, the Car Air-Conditioning Compressor Business has adopted a variety of approaches to promote energy conservation at its production lines. Determined to further strengthen initiatives for reducing CO_2, in fiscal 2009 we once again selected a model line from among the production lines for car air-conditioning compressors at the Kariya Plant and implemented various reduction measures.

Looking at a breakdown of CO_2 emission sources at car air-conditioning compressor production lines, electricity and compressed air account for the greatest proportion of CO_2 emissions. With this in mind, we are striving to reduce CO_2 emissions based on two themes. Specifically, we will aim for "just in size" by reducing the use of power required for production to an absolute minimum while eliminating waste. We will also aim for "zero compressed air" by eliminating its use. Compressed air causes large losses from the air-generation to usage stage as a result of electric conversion losses and leaks inside pipes. In adhering to these themes, we are identifying what needs to be done to yield significant results through partial modifications to facilities based on the assumption that these measures will be deployed across the Group.

Breakdown of CO_2 Emissions at Car Air-Conditioning Compressor Production Lines



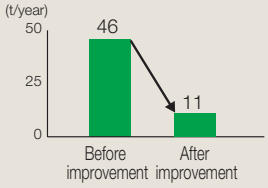
Case Example of an Improvement at a Model Line

Improving the Drying Process for Finished Products

Toyota Industries significantly improved the drying process for finished products by shifting to using low-pressure air blowers to dispel cleaning water instead of high-pressure air. Since using an air nozzle with the same radius as that for the high-pressure method would not deliver sufficient force to dispel the cleaning water, we expanded the radius of the air nozzle while increasing the flow volume of the low-pressure air to attain the same effect.

By adopting this method, we have achieved a 35-ton, or 76%, reduction in CO_2 emissions. In tandem, we are carrying out in-house manufacturing of blowers, which utilize the existing technologies of the Car Air-Conditioning Compressor Business, thereby yielding dramatic cost benefits.

CO_2 Emissions



Internally manufactured blower (Under development)

Topics

Hazu Academy Global Learning Center Preserves the Surrounding Rich Natural Landscape and Protects the Environment

The Hazu Academy, a global learning center opened in May 2009 in Hazu, Aichi Prefecture, adopts numerous environmentally conscious measures, including the use of natural energy and rooftop greenery to curb global warming.

Exterior concept image of the Hazu Academy global learning center

• Preserving the Surrounding Landscape

The Hazu Academy makes use of innovative schemes and concepts in all areas for "creating, protecting and cultivating a rich landscape." For example, to maintain the natural topography of the grounds, which straddle the coastline, the center's building features a sectional configuration to diminish any sense of encroachment into the surrounding areas. Additionally, extensive efforts were made to maximize the protection of existing green spaces throughout the entire premises while aiming for harmony with the surrounding natural environment via a well-balanced blending of existing and new green areas.

As another noteworthy feature, the center's walkways and parking lot are made from recycled concrete blocks spaced at regular intervals, with the spaces in between the blocks filled with a paving material that promotes grass growth. This innovative scheme helps to mitigate rises in summer temperatures of regular road and other surfaces and increases green spaces.

Green blocks

• Solar Power Generation

CO_2 emission reduction effect (approximate calculation): 66.8t-CO_2/year

Solar cells are installed on the rooftops of the main building and the outside parking lot and are linked to the center's electric power facilities. Surplus power is then sold to electric power companies.

Solar panels

• Wind Power Generation

CO_2 emission reduction effect (approximate calculation): 0.05t-CO_2/year

Five vertical-axis wind turbines, which can operate regardless of wind direction, have been installed at the center. These turbines are also ideal for harmonizing with the surrounding area because they rotate more quietly and are less subject to bird strikes than propeller-type turbines.

Wind-power unit

• Rooftop Greenery

CO_2 emission reduction effect (approximate calculation): 0.4t-CO_2/year

By greening part of the rooftop, we are reducing the heat load from the center's roof.

Rooftop greenery

• Optical Ducts

CO_2 emission reduction effect (approximate calculation): 0.2t-CO_2/year

Capturing sunlight with optical ducts for internal illumination contributes to energy savings during the daytime.

Optical duct

Resource Utilization

Approach to Resource Utilization

To achieve efficient use of finite resources, Toyota Industries promotes design and development that implements the 3Rs: reduce materials used by using them more efficiently, reuse products and parts that have completed their service life and recycle resources.

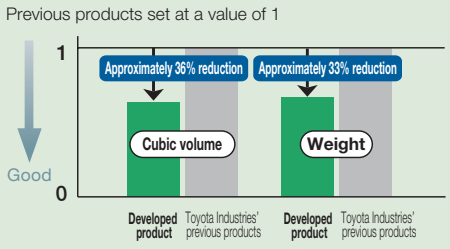
We also aim to improve resource efficiency and reduce waste generation at the source through such measures as increasing yields at every manufacturing process, while also promoting in-house reuse and recycling.

Products Promoting Resource Savings through Miniaturization and Reduced Weights

By reducing materials used, in fiscal 2009 Toyota Industries achieved an approximately 36% reduction in cubic volume and a roughly 33% weight reduction for its 100W DC-AC inverter, which is certified as an environmentally friendly product. Moreover, recycled aluminum was used as the primary covering material for the inverter.

100W DC-AC inverter

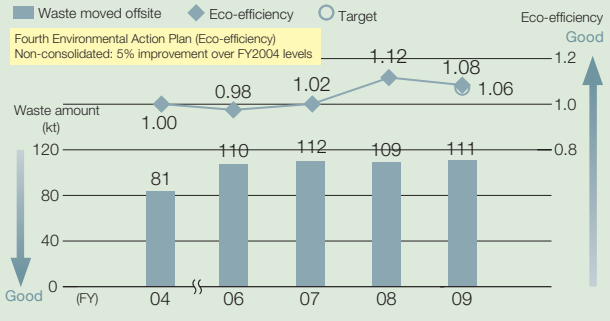
Comparison of Cubic Volume and Weight



Production Curbing of Waste Generation at the Source

In fiscal 2009, we carried out production activities targeting a 6% increase in eco-efficiency over fiscal 2004 levels. The Obu Plant switched chemicals for treating wastewater to reduce the volume of sludge generated. In addition, we implemented measures to raise the yields of presses at the Takahama Plant. These initiatives enabled us to attain our target, as we achieved an 8% improvement in eco-efficiency over fiscal 2004 levels. We will continue to promote improvement activities with the aim of attaining a balance between operational efficiency and resource efficiency.

Waste Generated



Production Building a System for Resource Utilization by Sharing Information among Business Divisions

Toyota Industries' Compressor Division examined the possibility of reusing protective materials (PVC sheets) from inbound deliveries of components, which it previously discarded, in other business divisions. It was found that the Textile Machinery Division could reuse these materials as cushioning materials for auxiliary parts shipped externally.

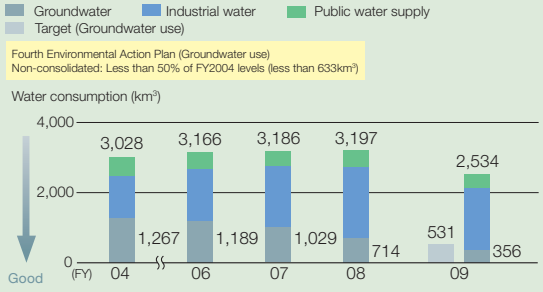
Accordingly, we set up a dedicated collection box for gathering such materials from the Compressor Division for use by the Textile Machinery Division. The introduction of this recycling system has led to the complete elimination of discarded protective materials.

We will continue to promote information sharing through active interchanges among business divisions and will implement measures that allow us to utilize resources while eliminating waste.

Production Reduction in Water Consumption

Giving strong consideration to the risks of ground sinkage and effective use of limited resources, Toyota Industries places particular emphasis on efforts to curtail the use of groundwater. In fiscal 2009, we achieved our target by realizing a 20% reduction in the use of groundwater compared with the previous fiscal year by taking such steps as recycling wastewater and recovering and reusing steam drainage.

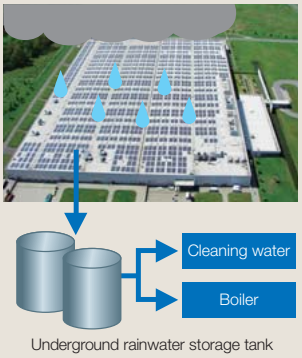
Total Water Consumption



Topics

Rainwater Capture System

To make more effective use of water resources, Toyota Industries has installed a rainwater capture system at the Higashiura Plant and the Takahama Plant's TMHG Technical Center. The system also has been adopted overseas at TD Deutsche Klimakompressor GmbH (TDDK), our car air-conditioning compressor manufacturing base in Germany. At TDDK, rainwater collected on the roof of the building is stored in an underground tank and used for washers and other machines.



Underground rainwater storage tank

Reduction in Environmental Risk

Approach to Environmental Risks

Toyota Industries recognizes that the prevention of environmental risks, such as environmental pollution and violations of environmental laws resulting from its business activities, is a crucial corporate responsibility. Based on this awareness, in developing products, Toyota Industries works to strengthen the management of chemical substances and reduce amounts of chemicals used, focusing on the entire product lifecycle, from development and production to disposal and collection.

In conducting operations, top priority is placed on preventing risk during the production process, and emergency training drills are implemented to ensure quick response to any possible contingencies.

Products Management of Substances of Concern

To strengthen the management of chemical substances in accordance with the European REACH*1 regulation, Toyota Industries has completely rebuilt the MARSY*2 system to ensure the integrated management of constituent materials as well as chemical substances contained in all our products. By revamping this system, we have dramatically strengthened the system's functions and handling capabilities.

Under this system, we are now able to tabulate the amounts of chemical substances contained as well as identify components that use chemical substances on a cross-divisional, Group-wide basis.

*1: REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) is a system for the comprehensive registration, evaluation, authorization and restriction of substances of concern within the EU, and targets parties involved in the manufacture and import of substances of concern.

*2: MARSY stands for Material-Data Research System.

Production Risk Assessment Program Based on a Quantified Environmental Impact Index

As articulated in the Fourth Environmental Action Plan, Toyota Industries' action policies for the reduction of environmental risks in production are to "minimize environmental risks" and "further reduce emissions of substances of concern." As it undertakes its activities, Toyota Industries implements its own quantified management index to properly calculate environmental impacts*3.

Toyota Industries has already achieved fiscal 2011 targets contained in the Fourth Environmental Action Plan and has set even higher targets as we proactively carry out our business activities. For fiscal 2009, we targeted a 20% reduction in environmental impact on a non-consolidated basis and a 22% reduction on a consolidated basis (manufacturing companies in Japan) compared with fiscal 2004 levels. To attain these targets, we promoted reduction activities focused mainly on coating processes, which use large amounts of substances of concern. As specific measures, for the piston coating process, the Compressor Division promoted a switchover from conventional spray coating to roll coating, which has better coating adhesion efficiency. In fiscal 2009, we completed the switchover at approximately 90% of the coating lines. Toyota Material Handling Japan and the Vehicle Division also proceeded with a switchover to coatings and thinners containing smaller amounts of substances of concern. As a result of these activities, Toyota Industries attained a 40% reduction in environmental impact on a non-consolidated basis and 45% reduction for consolidated operations. The entire Toyota Industries Group is committed to continuing to achieve further reductions in emissions of substances of concern.

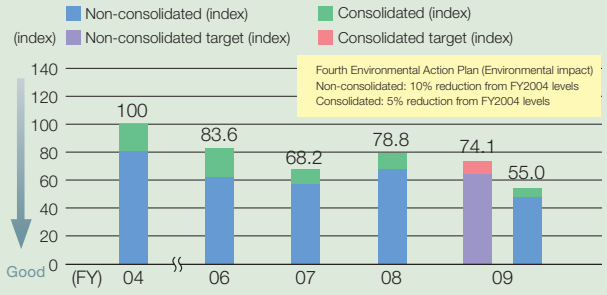
*3: Environmental impact

In fiscal 2007, we introduced a quantified environmental impact index for the integrated management of environmental impacts to properly manage different substances of concern with environmental and water pollutant properties as well as clarify priority.

<Substances covered by calculations for environmental impact index>

- Hydro-fluorocarbon (HFC) and Pollutant Release and Transfer Register (PRTR) law-designated substances emission volumes (volatile organic compound (VOC) derived)
- Water contaminants (biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrogen, phosphorous)

Environmental Impact Index



Production Legal Compliance

Toyota Industries continually undertakes activities to prevent quality abnormalities in wastewater, abnormal concentrations of soot and other risks occurring in the production process. In fiscal 2009, the chairman of the Production Environment Subcommittee (executive vice president in charge of overseeing production) and plant managers inspected manufacturing plants to make on-site confirmations of the status of risk management at each phase of production. Risk management methods at each plant are shared at all Toyota Industries' plants and utilized to manage risk and prevent abnormalities.

Inspecting the Nagakusa Plant

As part of measures to manage quality of wastewater discharged from production processes, we monitored tendencies when using varied amounts of chemicals during each process to ascertain any changes that would lead to abnormalities at facilities.

In fiscal 2009, both in Japan and overseas, no infringements of environmental legal standards were committed and Toyota Industries was not subject to any fines or penalties. Also, no environment-related legal action was taken against Toyota Industries.

Production Soil and Groundwater Pollution Countermeasures (Status Report)

Toyota Industries carries out surveys and purification of soil and groundwater contaminated from its past use of trichloroethylene as a cleaning agent. We report the survey results to local government authorities and provide information at local community meetings. As measures to prevent pollution from substances covered by the Soil Contamination Countermeasures Law as well as from grease and oils, we have drilled observation wells at all plants to conduct regular checks.

Trichloroethylene Readings (FY2009)

Plant	Weighted Average Concentration in Groundwater (mg/l)	Current Status
Kariya Plant	0.67	Cleanup in progress
Kyowa Plant	0.72	Cleanup in progress

Environmental Communication

Promoting Internal and External Environmental Communication

The Toyota Industries Group promotes environmental activities closely linked with society. Placing an emphasis on communicating our environmental activities to the Toyota Industries Groups' stakeholders, we strive to disclose a broad array of information to the general public through such means as the *Toyota Industries Report*, our Website and exhibits. At the same time, we are undertaking concerted efforts to interact with local communities, holding community roundtables and providing environmental education programs for local elementary school students.

Within the Company, we utilize the Environment Section of our Intranet to communicate and share pertinent information and hold environmental lectures for employees, while our monthly in-house magazine publishes articles on environmental issues to foster greater environmental awareness among our employees and their families.

We also held an Environmental Liaison Conference, which brings together personnel responsible for environmental programs at each Group company.

To further deepen environmental communications both within the Group and externally, we will continue to focus on sharing important environmental information.

Environment information available via Website (http://www.toyota-industries.com/csr/)

TMHU Hosts Tree Planting Events for TMHU and TIEM Employees and Their Families

In May 2008, Toyota Material Handling, U.S.A., Inc. (TMHU), a Toyota Industries Group subsidiary for selling lift trucks, hosted Columbus Volunteer Tree Planting events at two parks in Columbus, Indiana. In cooperation with staff in charge of managing green areas in Columbus, 50 trees such as black cherry trees donated by Toyota Industrial Equipment Mfg., Inc. (TIEM), a subsidiary for manufacturing lift trucks, were planted at each of the two venues.

Held to enhance green areas in the local community, the events were attended by numerous TMHU and TIEM employees and their families, and contributed to raising the environmental awareness of all participants.

Planting trees during Columbus Volunteer Tree Planting event

Columbus Volunteer Tree Planting signboard

BCSWMD Awards TIEM with a Certificate of Appreciation

TIEM has been sponsoring an Earth Day recycling event hosted by the Bartholomew County Solid Waste Management District (BCSWMD) since fiscal 2008. In April 2008, a BCSWMD commissioner awarded TIEM a certificate of appreciation for its ongoing support of the recycling center and its various programs.

Award ceremony

Participating in Eco-Products Exhibition

In December 2008, we exhibited our products at Eco-Products 2008, held at Tokyo Big Sight, to communicate our environmental initiatives. Along with presenting environmental technologies by showcasing Toyota Industries' hybrid vehicle components, car air-conditioning compressors and a tugcart (automatic guided vehicle system), an entertaining, easy-to-understand visual presentation introduced our environmental activities. A broad range of people ranging from elementary and junior high school students to various companies and the general public visited our booth. We also displayed structural models of car air-conditioning compressors, representative of Toyota Industries' long-time dedication to technological innovation. These models attracted a great deal of attention, effectively enabling visitors to see firsthand how car air-conditioning compressors have evolved over the years.

Toyota Industries booth

Entertaining visual presentation to introduce Toyota Industries' environmental initiatives

Unica Sets Up Environmental Activities Bulletin Board for Customers and Employees

In April 2008, Unica Co., Ltd. (Unica), a manufacturer of electric in-house transporters for the Toyota Industries Group, set up an environmental activities bulletin board to promote their initiatives to customers visiting their office and employees. Through the bulletin board, Unica strives to raise employees' environmental awareness and increase understanding of Unica's environmental activities both within the company and externally.

Visiting customers looking at environmental activities bulletin board

Environmental Accounting/On-Site Verification

Environmental Accounting

Toyota Industries regards environmental accounting, which evaluates the effectiveness of its environmental activities from the perspective of cost, as a critical tool not only for corporate management but also for the disclosure of quantitative information about the environment. As such, we are continually striving to further enhance our environmental accounting systems. Environmental accounting data is collected in compliance with the Ministry of the Environment's *Environmental Accounting Guidelines 2005 Edition*.

Scope of data collection: Toyota Industries, TIBC Corporation
Data collection period: April 1, 2008 – March 31, 2009

Fiscal 2009 Results

Environmental Conservation Costs*1

The total cost of environmental conservation programs in fiscal 2009 was ¥9.4 billion. Global environmental conservation costs primarily included the introduction of a solar power generating system, wind power generating system and optical duct system at the Hazu Academy, a global learning center, in Hazu, Aichi Prefecture.

Research and development costs included the development of the following products: a diesel engine hybrid lift truck, which reduces the CO_2 emissions and fuel consumption by approximately 50% while maintaining the same level of performance as the current diesel engine lift truck, as well as the ES14 electric compressor developed specifically for the latest Prius that is roughly 20% smaller and lighter than the previous compressor.

*1: Depreciation expenses are not included in environmental conservation costs. Costs and investments that include objectives other than environmental aspects either have the difference aggregated or the component removed.

Environmental Conservation Benefits

The benefits of environmental conservation indicate the accumulated outcomes of yearly environmental conservation measures.

In fiscal 2009, CO_2 emissions were reduced by a total of 72,000 tons. As a major achievement, the Energy Supply Control Section and manufacturing bases cooperated to implement vigorous energy conservation initiatives, which culminated in the reduction of roughly 40,000 tons in CO_2 emissions on a non-consolidated basis alone.

Economic Benefits of Environmental Conservation Initiatives

Toyota Industries calculates the actual economic benefits of environmental conservation initiatives through calculable benefits, including reductions in energy costs and wastewater treatment costs, as well as profits from the sale of recycled waste products.

On-Site Verification

Up until fiscal 2008, we had asked an external institution for an independent verification of the accuracy and consistency of environmental data included in the *Toyota Industries Report*. In fiscal 2009, however, Toyota Industries' Plant Engineering & Environment Department primarily conducted on-site verification by utilizing accumulated know-how.

[On-site Verification Sites]

Nagakusa Plant: Manufacture of automobiles
Nishina Industrial Co., Ltd.: Manufacture and sales of devices for industrial vehicles and construction machinery

[Items to be Verified]

1. Adequacy of the scope of data collection; validity of data measurement, collection and calculation methods; validity of internal verification
2. Trustworthiness and accuracy of collected/calculated data as well as data reported to the Head Office; accuracy of reporting method to the Head Office

[Results]

1. The verified sites retained original data (evidence) for all statistics, which were confirmed valid.
2. All discrepancies identified during verification have been corrected.

Environmental Conservation Costs

(Millions of yen)

Category		FY2009		FY2008	
		Investment	Expenses	Investment	Expenses
Business area costs	Pollution prevention costs -Preventing air pollution -Preventing water pollution	330	1,014	1,074	753
	Global environmental conservation costs	1,075	3,665	934	3,055
	Resource utilization costs	123	1,545	225	1,718
Upstream/downstream costs		–	–	–	25
Management costs		109	1,068	48	906
Research and development costs		–	393	–	909
Social contribution activity costs		7	30	8	14
Environmental remediation costs		–	9	1	20
Total		1,644	7,724	2,290	7,400
		9,368		9,690	

Environmental Conservation Benefits

Environmental Impact	Achievements
CO_2	72,000t decrease
VOC	538t decrease
Generation of waste products	24,982t decrease
Water	901,000m^3 decrease
SO_X	0.1t decrease
NO_X	34t decrease
COD	5.6kg decrease

Economic Benefits of Environmental Conservation Initiatives

(Millions of yen)

Item	Details	Amount
Revenue	Returns from sale of recycled waste products	5,635
Cost Reduction*2	Energy cost reductions	2,591
	Cost reduction by resource savings (including reductions in amount of water use and amount of wastewater)	94
Total		8,320

*2: Cost reduction is calculated by multiplying the volume of reduction in environmental impacts by the unit cost.