

Environment

Message on Environment

Since its inception, Toyo has been exerting advanced comprehensive engineering capabilities to reduce burdens on the global environment through project execution in the energy and material industries.

We are confident that it is Toyo's mission to contribute to "sustainable development" that can balance competing goals for economic development and conservation of the global environment.

In the execution of projects, Toyo focuses on reducing environmental loads of plants by actively employing such measures as energy - saving technology, appropriate wastewater treatment processes, and technologies for removing hazardous substances from emission gases.

As a global Corporation, Toyo will strive to develop, acquire, and expand global environment conservation technologies; to promote technology exchanges with Clients throughout the world; to make proposals on environmental issues; and to contribute actively to solving environmental issues such as global warming through international cooperation frameworks.

• • • Efforts for Environment • • •

■ Office Activities*

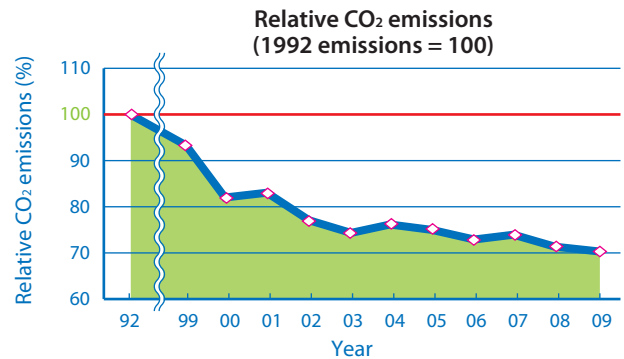
● Reduction of CO₂ emissions

CO₂ emissions from offices are calculated from electricity consumption, urban gas consumption, and consumption of fuel oil A used for emergency power supplies.

Toyo launched energy-saving activities in 2000. In 2001, we made energy saving investments, such as installing lighting inverter stabilizers, which produced positive results in 2002 and after.

CO₂ emissions in 2009 were reduced by 30% from the 1992 level.

* Office activities are defined as those of the Engineering Center.



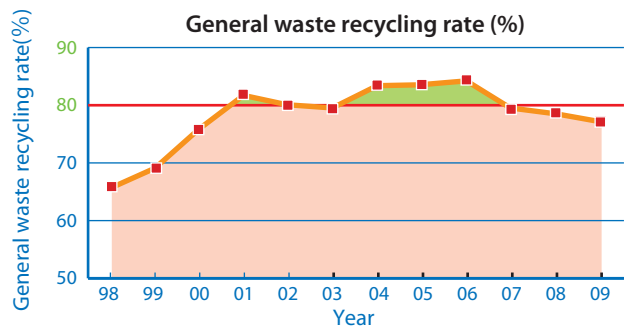
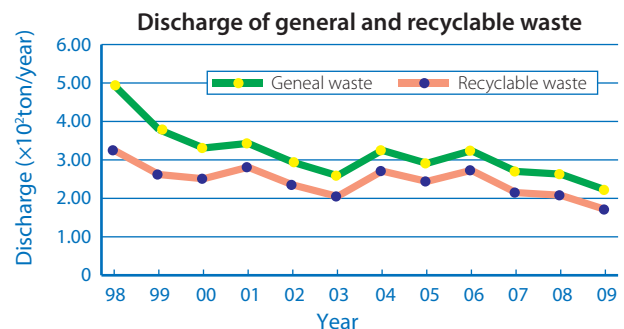
● Reduction of general waste and improvement of general waste recycling rate

Discharge of general and recycling waste* decrease gradually over the year and each waste is reduced to 220 ton and 170 ton respectively in 2009.

Since 2001, when separation of general waste and double-sided printing were encouraged for the first time, the general waste recycling rate has been more than about 80%, as is required by guidelines.

However, the general waste recycling rate in 2009 decreased to 77.1%. We will make more efforts to reduce the discharge of general and recyclable wastes to improve the general waste recycling rate.

*Recycling waste is the recyclable general waste including paper output from personal computer and photo-copy machine, newspaper, shredded paper, cardboard, pet bottle, glass bottle, can and garbage.



■ Construction Waste Gross Discharge

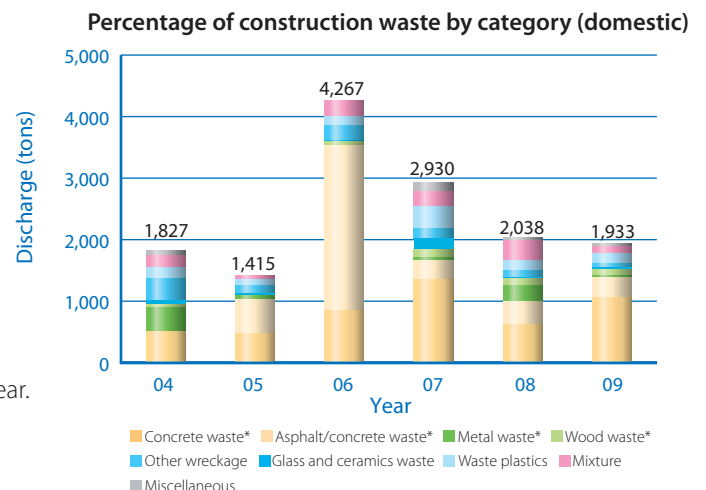
● Domestic construction sites

(1) Percentage of construction waste by category

The figure to the right shows the weight of construction waste and its categories in proportion.

The weight of construction waste discharge from domestic construction sites in 2009 was 1,933 tons, 105 tons less than discharged in 2008. Toyo implements various kinds of construction and percentage of waste by category tends to be different in each year.

The total discharge of four categories of waste marked with (*) amount to 83%, comparatively high value, in 2009.



(2) Percentage of construction waste by disposal methods

Percentage of construction waste by disposal method (recycle, landfill, and incineration) is shown in the figure to the right.

Percentage of recycle was 94.9% in 2009.

In 2009, the weight of construction waste discharged from large and medium scale sites was 95% of total discharge and its recycling rate was high value 97%. This is the cause of largely improved recycling rate.

Recyclable wastes separated from other wreckage, glass, ceramics, and waste plastics contribute to high recycling rate in addition to recyclable wastes including concrete waste etc..

(3) Recycling rates of four items specified by the Construction Material Recycling Act

The recycling rates of four items specified by the Construction Material Recycling Act are illustrated to the right.

The recycling rates for concrete waste and asphalt/concrete waste have been kept to almost 100%.

The recycling rate of metal waste was as high as 100%, with the exception of 2005.

The recycling rate of wood waste was largely improved to 99.7% in 2009.

●Overseas project sites

Weight of construction waste discharge and percentage by category

The total discharge weight in 2009 was 55.5 thousand tons, about a fifth of that in 2007 and decreased by about 13 percent from 2008. This is because some large-scale projects in 2007 were completed, reducing largely the weight of construction surplus earth/sludge.

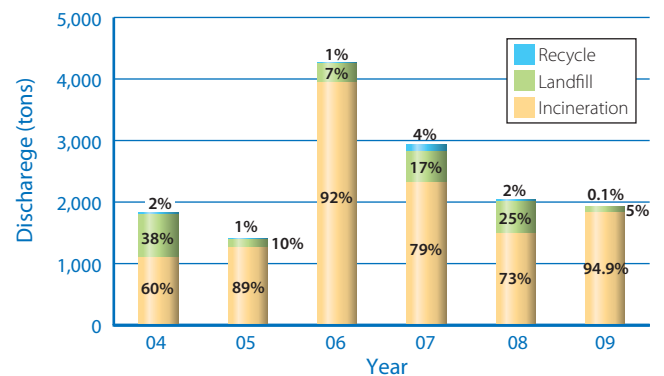
Comparison of weight of construction waste discharge, except construction surplus earth/sludge, between each year was made to eliminate the special factor of extremely large percentage, 75%, of construction surplus earth/sludge in 2007.

Toyo implements various kinds of construction method and percentage of waste by category tends to be different in each year.

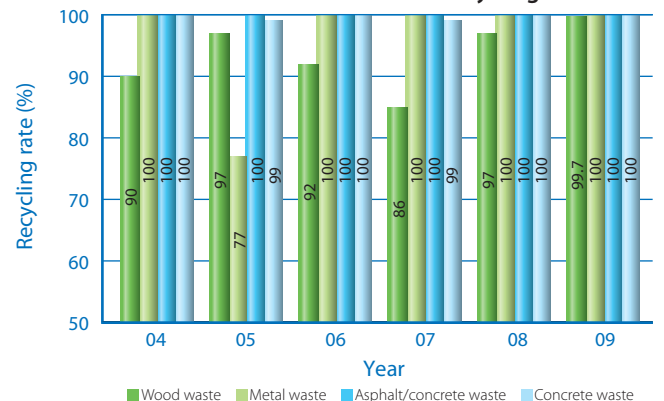
Camp garbage and wood waste in 2009 were larger in weight than those in past two years.

Toyo will continue to summarize the construction waste discharge weights at overseas project sites to utilize the data for reducing the environmental load.

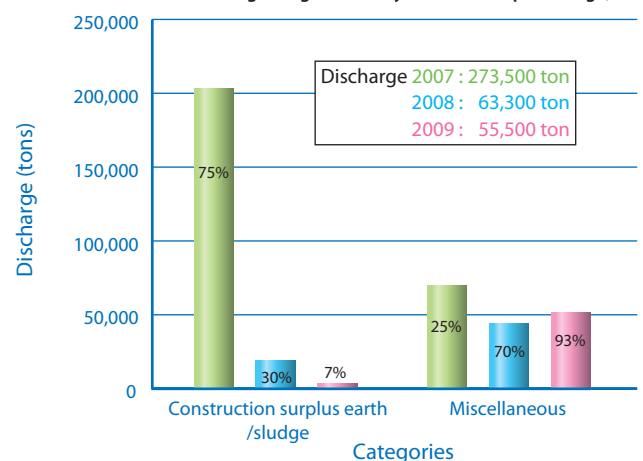
Percentage of construction waste by disposal method



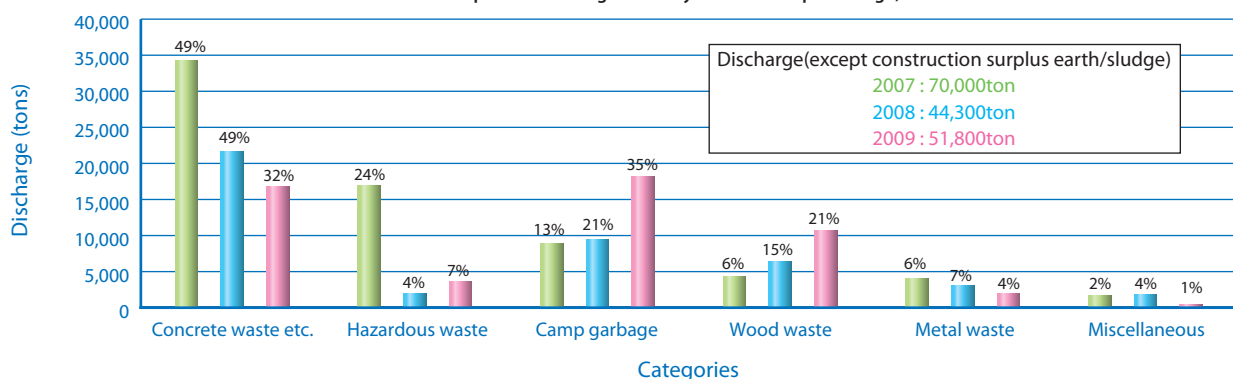
Recycling rates for four items specified by the Construction Material Recycling Act



Weight of construction waste discharge and percentage by category
Comparison between construction surplus earth/sludge and miscellaneous
(Proportions of individual waste categories to the total discharge weight in each year shown as percentage)



Weight of construction waste discharge and percentage by category
(Proportions of individual waste categories to the total discharge weight except construction surplus earth/sludge in each year shown as percentage)



■Engineering, Procurement, and Construction Activities

●Engineering

Toyo makes efforts to reduce the environmental load in plant operation. These efforts start in the engineering stage. Based on ISO 14001 and ISO 9001, Toyo reduces the environmental load that occurs in plant operation, through the following work processes:

- (1) Clarification and confirmation of Client requirements (environmental specifications)
- (2) Design review
- (3) Design verification
- (4) Design validation

Toyo makes efforts to reduce environmental load in design work through “Eliminate 3M - Principle” (Eliminating *muri* (overdoing), *muda* (wasting), and *mura* (irregularity)), while striving for efficient design work and methodology as an environmental target.

Moreover, Toyo contributes to Client satisfaction with energy and resource conservation at the production plants by actively proposing Toyo’s energy- and resource-saving technologies to the Clients.

●Procurement

As one of its environmental targets, Toyo has set up “promotion of green procurement.” Toyo actively promotes the procurement of equipment and materials from environmentally conscious green enterprises*.

In 2006, Toyo issued an in-house guideline titled “Guideline for Green Procurement.” In line with this, we continue green procurement, aiming to achieve a green procurement rate of more than 90%.

In 2009, the amount of procurement from green corporations reached 90% of the total procurement amount and increased by 3% since 2008. Toyo regards this percentage as the green procurement rate.

Toyo promotes paperless work to contribute to resource saving by computerizing inquiries from Clients, quotation requests to vendors, quotations from vendors, and inspection reports.

* Environmentally conscious green corporations are vendors that have acquired ISO 14001 or that are carrying out environmental conservation activities, selected from the 100 largest vendors to Toyo.

●Construction

Among Toyo’s business activities, site construction work creates the largest environment load. At construction sites, the following environmental targets are set up and efforts are made to reduce the environment load:

- (1) Appropriate treatment of construction waste
- (2) Appropriate treatment of chemicals (paint, etc.)
- (3) Environmentally conscious construction method
- (4) Environmentally conscious material transportation
- (5) Turbid water treatment and oily water separation



Safety and environmental meeting at construction site
Meetings are held regularly at construction sites to familiarize workers with knowledge regarding safety and environmental management.

■In-house Environmental Education

Toyo started in-house environmental education to familiarize all employees including directors with the necessity of Environmental Management System (EMS) activities since April, 2009.

EMS is associated with the reduction of paper, waste, electricity, and water consumption in offices as well as environmental conservation activities at construction sites. However attention is also paid to the fact that “Eliminate 3M - Principle” (Eradication of *muri* (overdoing), *muda* (wasting), and *mura* (irregularity)) in overall engineering work are significant environmental aspects. Toyo provides education focusing on these environmental aspects.

Toyo held the regular course once a week for employees and uses video conferencing equipment for attendees at overseas sites. In 2009, 82% of the employees underwent this course.

In-house environmental education



Attendees’ side
Sao Jose dos Campos, State of Sao Paulo
Brazil time: AM 8:00



Lecturer’s side
Engineering Center, Teleconference room
Japan time: PM 8:00

• • • Environmental Conservation Activities at Sites • • •

■ Ammonia and Urea Project in Venezuela

Petroquímica de Venezuela, S.A. (PEQUIVEN) awarded this plant to the Consortium of Toyo, Ferrostaal A.G., Germany, and Y&V Ingeniería y Construcción, C.A., Venezuela. The plant is to produce ammonia and urea by natural gas as raw material. The plant is located in Morón, Carabobo State, 150 km west of Caracas.

Environmental Survey

The neighborhoods of the plant area is rich in wildlife such as turtle, iguana, birds etc.. The Project team took environmental protection measures as follows

- Protection of the water resources and prevention of water pollution
- Noise control of equipments
- Study of atmospheric phenomena and others.

The environmental measures are categorized for each item and controlled to ensure that it is followed by one and all. The results are periodically informed to Client and Local Government body.



A turtle returning to the sea after laying eggs



Birds near the complex



An iguana found in the complex

Voluntary activity of picking up garbage at coast

The plant is located along the sea coast. On the annual Marine Day (the third Saturday, September), representatives of PEQUIVEN, Local Community, Local Environmental Study Group joined hands with Consortium members to pick up garbage on the shore. About 60 people participated. A video was recorded.



Volunteer garbage pick up on the coast

Waste Management

Construction waste and general waste are separated by type. A person is placed in charge of managing each type of waste and the majority of the waste is recycled. For example, ferrous metals are sold to recycling companies, or donated along with wood to the local technical school for use at teaching materials. Soil is also donated to restore roads in flood-prone areas.



Soil donation for road restoration



Equipment installed for the study of atmospheric phenomena

■ Silane & Siloxane Project in China

This project, awarded by Dow Corning Co.,Ltd., is for construction of Silane & Siloxane plant in the suburbs of Zhangjiagang city, Jiangsu province, China. Aker Solutions China and Toyo have been jointly awarded and executed the Project Management. Now the construction is at final stage.

Ground contamination control

Under this requirement, all users of chemical including paint, diesel, need to provide with drip tray for control of spillage. Drip tray is also required to be provided under any stationary fuel operated equipment to contain any leakages. Paint store need to be concrete-paved in addition to drip tray so that all contaminated concrete can be removed and disposed as waste at project completion.



Drip tray for ground contamination control

Waste control

All construction wastes are disposed at a central scrap collection center and all scrap divided into different categories. Project has different compartments for wood waste, paper waste, concrete waste, general waste, scrap metal, hazardous/contaminated waste.



Sorting & storage compartment for construction waste

Dust control

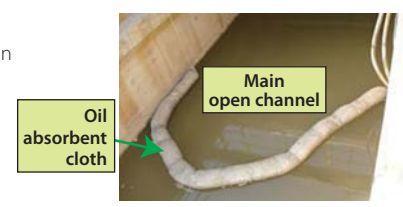
A water truck is provided on site to sprinkle water for dust control.



Water sprinkling truck

Water pollution control

All the rain water and surface water go to main open channel which goes to a public river. To prevent contamination to public water, oil absorbent cloth is being provided before the outlet. The water in the channel is also being tested at laboratory every week. Whenever any spillage into the channel is reported, immediate cleaning is activated.



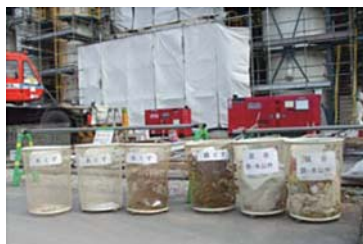
Oil absorbent cloth equipped at outlet of main open channel

■Project for Taiyo Oil Co., Ltd. in Japan (Shikoku Plant)

The project is to construct C3 splitter, Alkylolation Unit, Gasoline Desulfurization Unit, and Waste Water Treatment facility in the Residual Oil Fluidized Catalytic Cracker (RFCC), awarded by Taiyo Oil Co., Ltd. The construction site is at Shikoku Plant of Taiyo Oil Co., Ltd., located in Kikuma, Imabari-shi, Ehime Prefecture. The project is now at the final stage of construction.

Waste Storage Management

All construction waste is sorted into mixed waste, cardboard, wood waste, metal waste, etc., and collected into local refuse collection cages, and conveyed and stored in large containers located at a place in the plant. The large containers are transported to intermediate treatment vendors by a waste carrier.



Local refuse collection cages



Large container replacing work

Cleaning of nearby roads

Site Manager and a few members of each of the Contractors (total 20 participants) clean the public road for about 1 km from the main gate of the plant to the material storage every third Saturday. This is highly appreciated by local residents.



Departure of Site Manager for cleaning work

Traffic control and walking guidance for workers

Every morning, Site Managers of contractors give guidance to workers for proper walking, together with traffic control, along the side walk from the site office to the plant premises. At the entrance of the site office, a guard is located for traffic control.



Scene of traffic control



Guard near the site office entrance

■Project for Mitsui Chemicals, Inc. in Japan (Osaka Works)

Here is another example of environmental conservation activities in a construction project performed by Toyo at Mitsui Chemicals' Osaka Works.

Control of vehicles entering Mitsui Chemicals premises

Trucks, buses and other vehicles to be operated in the premises should conform to the regulations, under the Ordinance Relating Conservation of Life Environment of Osaka Prefecture. Construction vehicles are not permitted to enter the premises without a sticker "Conforming Vehicle" certifying that the vehicle meets the emission standards.



Construction vehicle permitted to enter the premises

Enlarged



Regulation-conformance sticker

Soil dust scatter prevention measures

After unloading soil in the premises, construction vehicles and platforms must be washed with water to prevent mud or pollutants from scattering when vehicles pass through open roads.



Washing construction vehicle wheels before departure

Concrete mixer chute washing

Concrete mixers are washed after the concrete is poured. In this case, washing water is not thrown away into soil. It is stored in a tank or in bags, brought back to a concrete plant, and neutralized in a waste water treatment facility.



Concrete-mixer-washing water receiving bag

Chute



Tank vehicle receiving chute-washing water

Tank facility

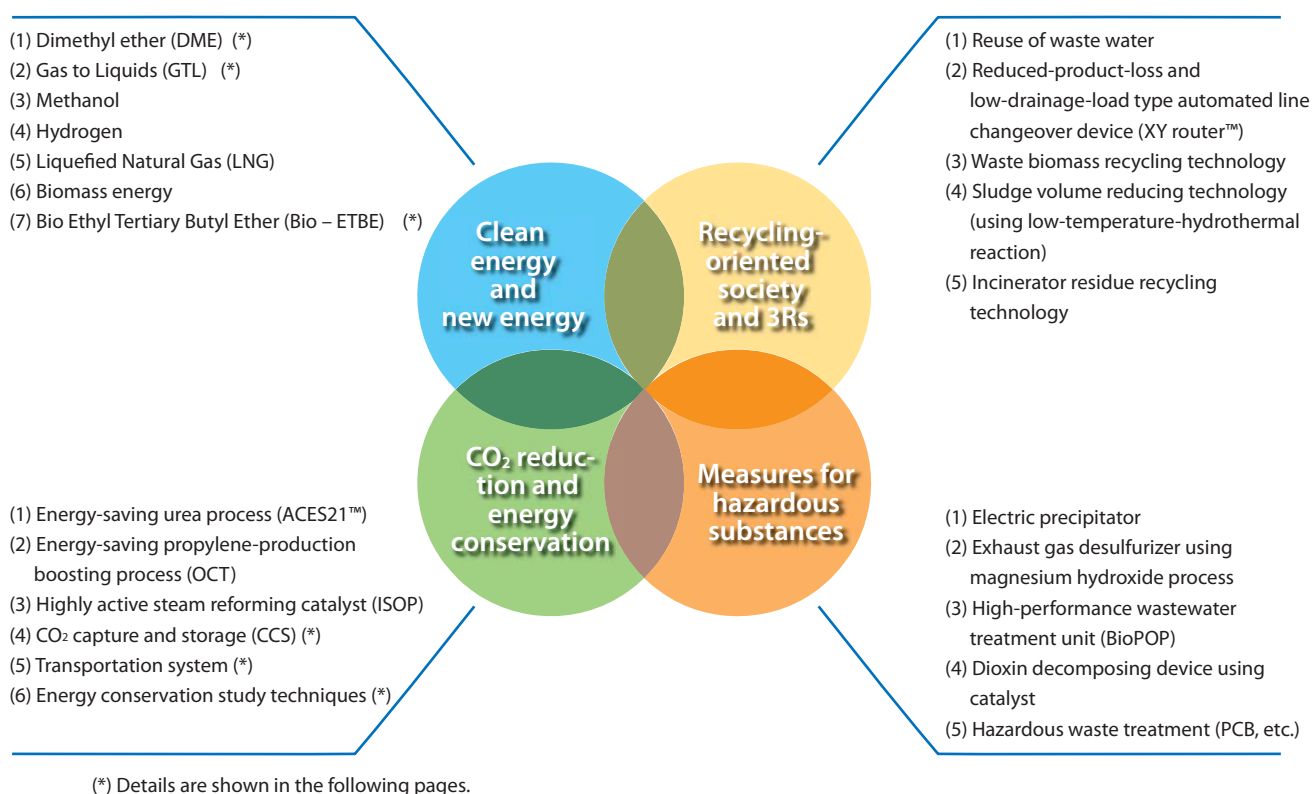
Receiving bag

• • • Toyo's Environmental Technologies • • •

Toyo actively promotes development, introduction, and improvement of technologies that contribute to the environment. Through utilizing these technologies, Toyo provides a variety of solutions to environmental conservation.

On the basis of accumulated knowledge and experience, Toyo aggressively applies R&D engineering* in the field of environmental conservation, making various approaches to clean energy and new energy, CO₂ reduction and energy conservation, a recycling-oriented society, the Reduce, Reuse, Recycle (3Rs) campaign, and measures for hazardous substances.

* R&D engineering is a technical service to facilitate the quick commercialization of laboratory scale technologies that Clients have developed.



■ Toyo's Solutions Contributing to Clean Energy and New Energy

● Dimethyl Ether (DME)

DME is a clean fuel that does not generate sulfur oxides or particulate matter when combusted because DME does not contain sulfur or ash. Toyo has developed indirect DME production technologies, by adding the DME synthesis process to the methanol plant. In the indirect method, methanol and DME may be produced together and production can be adjusted to suit market demand, enabling a highly flexible production strategy. In China, four DME plants under Toyo's license are operating successfully.

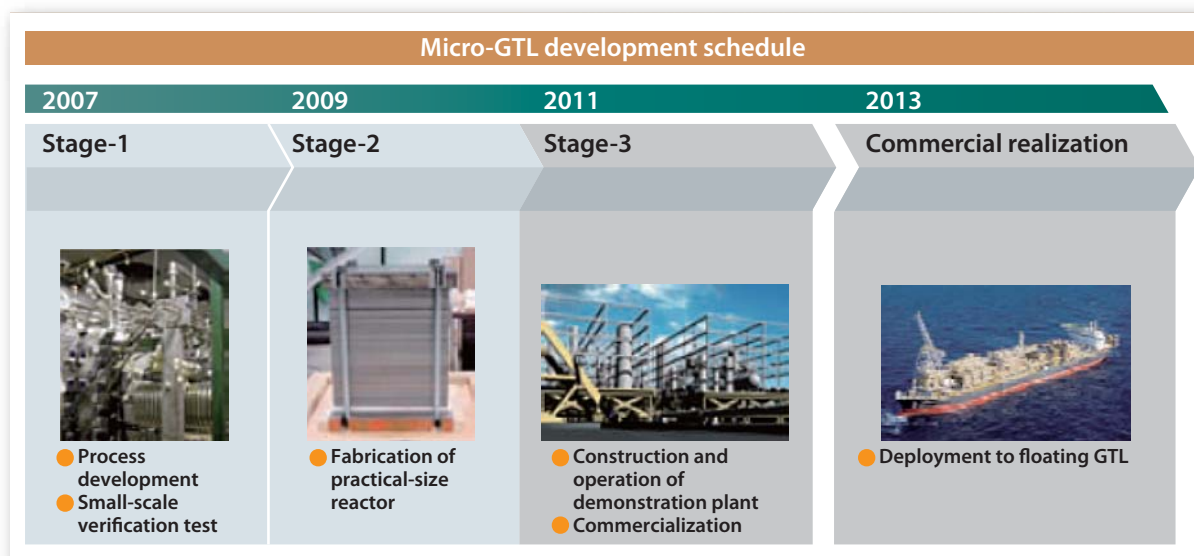


DME plant for Shanxi Lanhua Clean Energy Co., Ltd., China (140,000 t/y)

●Gas to Liquids (GTL)

GTL is a process that transforms natural gas or associated gas into a clean diesel fuel or naphtha containing less impurities than petroleum-derived products.

Since November 2007, Toyo has been developing micro-GTL process, which is compact and cost-efficient, jointly with Velocys Inc., the United States, and MODEC, Inc., Japan. The joint development project has been conducted successfully, aiming to achieve commercialization by the end of 2011 after constructing and operating a demonstration plant. Because of the compactness, the micro-GTL plant can be installed not only on shore but also on board a ship. Early commercialization of on-board GTL (floating GTL) is expected because it will allow deep-sea natural gas that has not been easily exploited to be effectively developed and utilized.



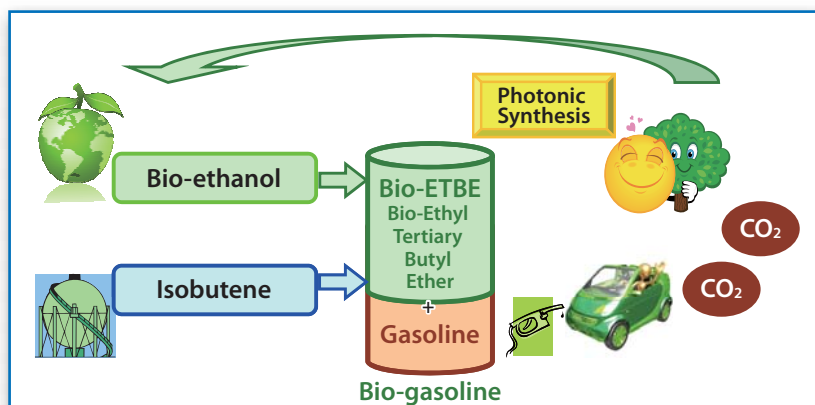
●Bio Ethyl Tertiary Butyl Ether (Bio-ETBE)

Bio-ETBE is produced by synthesizing Agricultural or Organic derived bio-ethanol and petroleum-derived isobutene. Bio-gasoline containing bio-ETBE is supplied to all automobiles at gas stations in the same manner as gasoline refilling.

When an automobile runs with bio-gasoline, a reduction of greenhouse gas emissions (mainly CO₂) from the automobile is expected from the carbon neutral concept*. The number of gas stations supplying bio-gasoline will greatly increase as permanent introduction of bio-gasoline is scheduled for 2010.

Toyo is implementing an engineering, procurement, and construction project to convert an existing MTBE (synthesized from natural gas-derived methanol and isobutene) facility to a bio-ETBE facility of JX Nippon Oil & Energy Corporation Negishi Refinery. This facility will be the first Bio-ETBE commercial plant in Japan.

* According to the Kyoto Protocol, CO₂ discharged from biofuel while it is burnt is not calculated as greenhouse gas emissions, because the organic plant from which biofuel is produced, absorbs CO₂ through photonic, and therefore CO₂ discharged as the biofuel burns does not increase the total amount of CO₂.

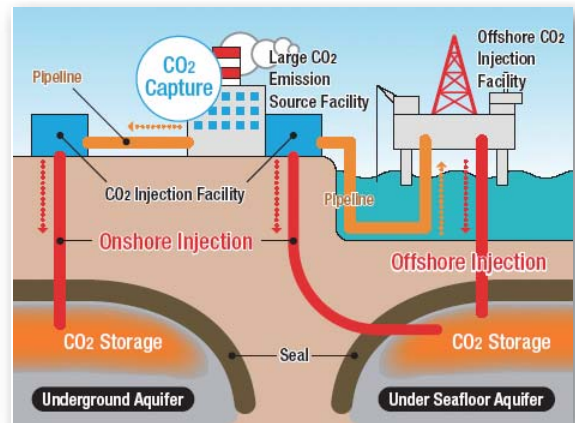


■ Toyo's Solutions to CO₂ Reduction and Energy Conservation

● CCS (Carbon dioxide Capture and Storage)

CCS is one of prospective measures for CO₂ reduction on a large scale. The Intergovernmental Panel on Climate Change estimates in its special report "Carbon dioxide Capture and Storage" (2005) that CCS could contribute to greenhouse gas reduction at a rate of 15% - 55% until the year 2100.

Toyo has participated in the activities of Japan CCS Co., Ltd., established in 2008 for the early realization of large-scale CCS demonstration testing in Japan and is working as a founding member of the Global CCS Institute (GCCSI), which was established in 2009.



CCS image

● Transportation system

Railway systems are re-evaluated worldwide as public transportation means which are environmentally friendly compared with automobiles and aircraft. Demand for railways as urban transportation means is increasing in countries that are suffering from chronic traffic congestion caused by poorly developed transportation infrastructure.

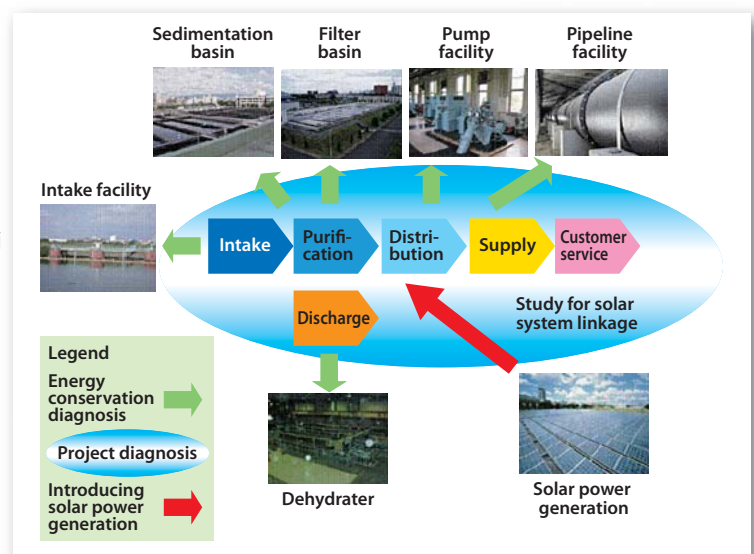
To respond to such demand, Toyo founded Toyo Transport Engineering Co., Ltd. in October 2007, jointly with Mitsui & Co., Ltd., establishing a framework to support technologies distinctive to railway construction. As a system integrator, Toyo aims to provide high-quality railway systems improving convenience with environmental friendliness and creating employment, and thus contributing to local communities.



● Energy conservation study techniques

As economic development progresses, demand for water increases, causing serious water-shortage in many countries due to insufficient water sources and leakage from water piping.

Jointly with Osaka Municipal Waterworks Bureau, Kansai Economic Federation and some companies backed up by the Japanese government, Toyo diagnosed energy and water conservation on the total waterworks system from water sources to faucets in Ho Chi Minh City in Vietnam. As a result, Toyo proposed some improvement ideas of plural waterworks systems by streamlining energy use at water purification and water conveyance and distribution facilities and by utilizing solar and other renewable energy resources.



Source: Osaka Municipal Waterworks Bureau

Selecting an idea contributing to the largest improvement, Toyo will design, install, and operate facilities for the purpose of project verification.