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 fields of 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 energy-saving technologies, appropriate waste water treatment processes, technologies for removing hazardous substances from emission gases, etc.

As a global corporation, TOYO will strive to develop, acquire, and retain global environment conservation technologies, to promote technology exchanges with clients in 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 CO_2 emissions

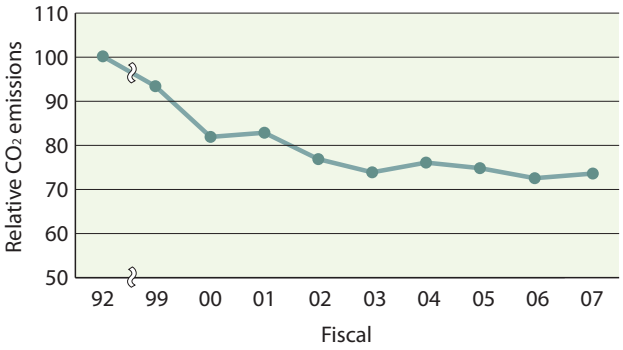
CO_2 emissions are calculated from electricity consumption, urban gas consumption, and consumption of fuel oil A used for emergency power supply.

TOYO launched energy saving activities in fiscal 2000, with office lights being turned off during lunch breaks and unnecessary lights removed. In fiscal 2001, we made energy saving investments, such as installing lighting inverter stabilizers, which produced good results in fiscal 2002 and later.

CO_2 emissions in fiscal 2007 were reduced by 26.1% from the 1992 level.

Note: Office activities are those in the Head Office and Engineering Center (Narashino City).

Relative CO_2 emissions (1992 emissions = 100)



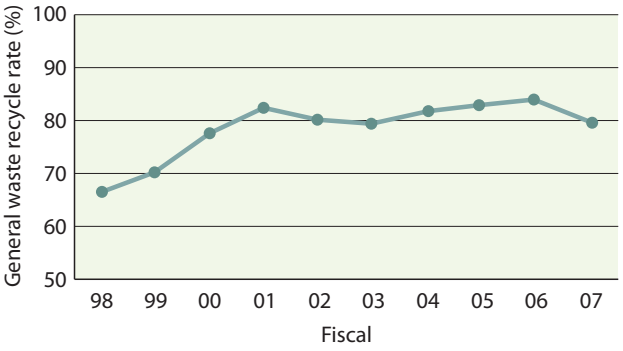
●Improvement of general waste recycle rate

The general waste recycle rate has been more than about 80% since fiscal 2001 when segregation of general waste and double-side printing were encouraged for the first time.

The general waste recycle rate for fiscal 2007 was 79.3%.

TOYO will continue our efforts for maintaining the recycle rate over 80%.

General waste recycle rate (%)



■Construction Waste Gross Discharge

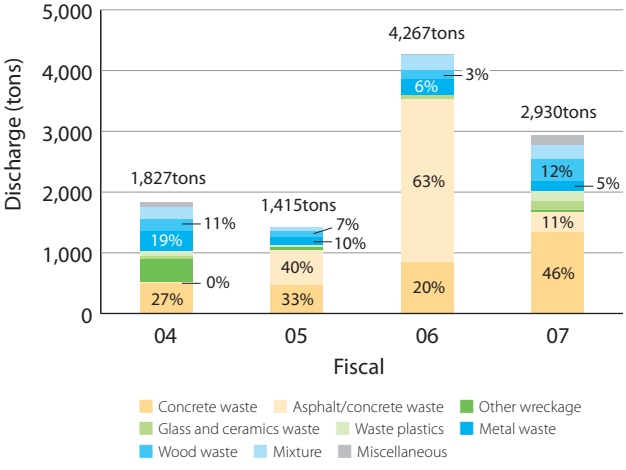
●Domestic project sites

(1) Volume of construction waste discharge

The volume of construction waste discharge from domestic project sites in fiscal 2007 was 2,930 tons, about 1,300 tons less than 4,267 tons discharged in fiscal 2006.

* Renewable waste includes waste concrete, waste asphalt-concrete, metal waste, and wood waste.

Percentage of construction waste by category (% shows only that of recyclable waste *)



(2) Percentage of construction waste by disposal methods

Waste percentage by disposal method (recycle, landfill, and incineration) is shown in the figure: 79% recycled, 17% landfilled, and 4% incinerated. The recycle rate decreased to 79% from 92% in fiscal 2006.

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

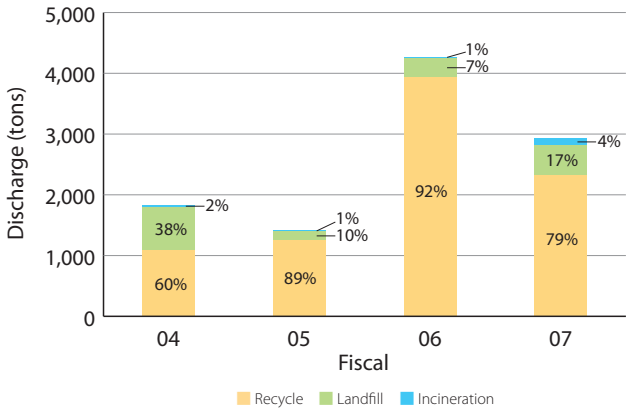
The recycle rates of four items specified by the Construction Material Recycling Act are illustrated.

The recycle rates of waste concrete and waste asphalt-concrete have been kept at almost 100%.

The recycle rate of metal waste has been as high as 100%, except for fiscal 2005.

Although the recycle rates have been increasing, it is considered that disposal of wood waste should be improved.

Percentage of construction waste by disposal methods



●Overseas project sites

Volume of construction waste discharge and percentage by category

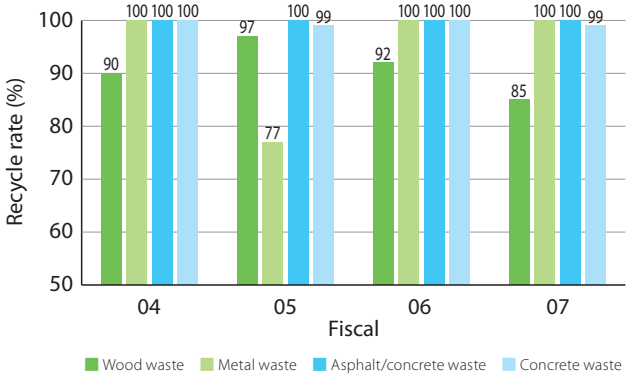
Since 2007, TOYO has been summarizing the volume of construction waste discharge from overseas project sites.

The total discharge volume was 272.3 thousand tons, about 100 times more than that from domestic project sites. This relates to the fact that about 80% of TOYO's orders are from overseas countries and the scale of work per overseas project is larger than that carried out domestically.

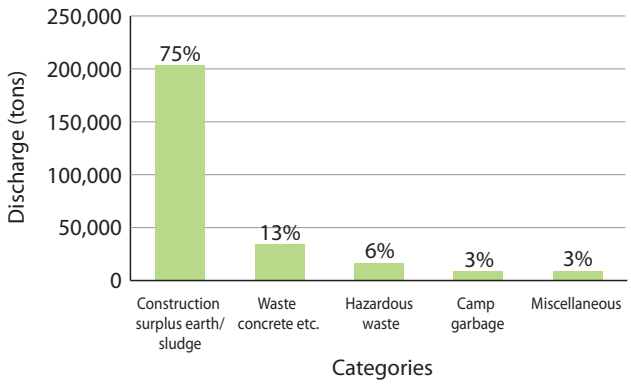
Construction surplus soil/sludge has the highest percentage of waste, 75%, which relates to the fact that fresh ground is exploited for overseas projects more often than for domestic projects.

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

Recycle rates of four items specified by the Construction Material Recycling Act



Volume of construction waste discharge and percentage by category (2007)



■Design, Procurement, and Construction Activities

●Design

TOYO makes efforts to reduce the environmental load in plant operation. These efforts are started in the engineering stage and continued in the construction stage. Based on ISO 9001, TOYO reduces environmental load that occurs at 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 has contributed to client satisfaction with energy saving and resource saving of plants, or TOYO's products, by investigating and improving energy saving and resource saving technologies proven through TOYO's experience, and by proposing such technologies to the clients.

Furthermore, TOYO has made efforts to reduce environmental load through its activities for "eliminating Muri (overdoing), Muda (wasting), and Mura (irregularity)" in design work, while striving for efficient design work and methodology as an environmental goal.

●Procurement

As one of our environmental goals, TOYO has set up "promotion of green procurement." For green procurement, TOYO carried out a survey of environmental management activities of 100 largest vendors-suppliers to TOYO. Vendors that had acquired ISO 14001 and vendors that carried out environmental management activities were qualified as "green corporations."

In fiscal 2007, the amount of procurement from green corporations reached 91% of the total procurement amount. TOYO regards this percentage as the green procurement rate.

In addition, TOYO has issued "Guideline for Green Procurement" as an intra-division guideline. The corporation makes efforts to continue the green procurement in line with the guideline, aiming to maintain the green procurement over 90%.

TOYO promotes paperless work, by computerizing inquiries from clients, quotation requests to vendors, and quotations from vendors as well as inspection reports.

●Construction

Out of TOYO's various work categories, construction site work causes the largest environment load. At a construction site, the following environmental objectives are set up and efforts to reduce the environment load are made:

Safety and environment meeting at construction site
Meetings are regularly held at a construction site to familiarize workers with the knowledge of safety management and environment.

(1) Appropriate treatment of construction waste

- Promote recycle of construction waste by separate collection.
- Check transportation permit and disposal permit.
- Visually check waste disposal at intermediate and final disposal sites.
- Check manifest (industrial waste control sheet) control status.
- Measure and summarize construction waste generated from all the domestic construction sites.

(2) Appropriate treatment of chemicals (paint etc.)

- Obtain Material Safety Data Sheet (MSDS) from paint suppliers.
- Give education about safety and toxicity as well as proper treatment of paints to workers related to painting on construction sites.

(3) Environment-conscious construction method

- Employ noise-free and vibration-free construction method.
- Control dust generation by paving roads and sprinkling water.

(4) Environment-conscious material transportation

- Supervise carriers for preventing leakage of transported materials from loading space.

(5) Turbid water treatment and oily water separation

- Separate mud and oil from turbid water and oil-containing sump water generated by excavation.

Introduction of Environmental Conservation Activities at Overseas Sites

■Saudi Arabia YANSAB EG-1 Project

The project involves the construction of an ethylene glycol producing plant for Yanbu National Petrochemical Company (YANSAB), Saudi Arabia. The project team is doing its best to deliver the plant successfully, which is now under commissioning. The project has been implemented with no lost time incidents under effective HSSE management system since the construction was started.

With regards to environment management, TOYO formulated an environmental policy first, and then set up the objectives and goals in line with the policy. In order to achieve the goals, we set up a program to reduce environmental impacts during construction and commissioning so as to maintain and improve the outstanding environmental performance of this project. This program requires internal environment education be implemented to improve knowledge and environmental awareness of all the workers.

Main equipment of the ethylene glycol producing plant

●Waste management

Waste containers are divided into the following four:

- Non-hazardous substances
- Hazardous substances
- Bio-hazardous substances
- Other substances

Waste container

●Noise management and monitoring

Daily noise monitoring, controlling, and recording are performed with noise level meters. Where noise exceeds 80 dB, ear protection is indicated obliging use of ear pieces.

Indication of ear protection

●Oil contamination control

Various oil leak preventing devices are arranged at various places in the construction site to allow actions be taken immediately in case of oil leaks. The oil leak protection device box contains oil absorbent, disposable working clothes, rubber gloves, long boots, shovel, protection mask, etc.

Oil contamination control applies to hydrocarbon storage area, fuel-driven machinery, and temporary fuel storage area.

Oil leak protection device box

■South Pars 678 Project in Iran

The project, awarded in May 2003 by Petropars Ltd., fully owned by National Iranian Oil Company (NIOC), is to construct a world-class gas processing plant. Natural gas, produced in a gas field off the Gulf, will be separated into LPG, condensate (light oil), etc. At the peak of plant construction, 16,000 workers were mobilized. The plant construction has been completed, and the plant is now under commissioning.

●Wastewater treatment facility

As the quality of daily life water discharged from the project site camp must meet the drainage standard of Iran, the site camp is equipped with a full-scale wastewater treatment facility. Clarified water treated by the facility is subjected to water quality analysis to make sure that it satisfies the drainage standard.

●Use of clarified water for irrigation

Clarified water subjected to the wastewater treatment is supplied to a forestation area for use for irrigation. Although the site region is desert, the forestation area is covered with green with clarified water after wastewater treatment. Site workers can enjoy green landscape.

Wastewater treatment facility
(aeration system using activated sludge)

Clarified water from the wastewater treatment facility

Forestation area

■REVAP Project in Brazil

This project is one of the refinery modernization projects for Petróleo Brasileiro S. A., the largest oil company in Brazil. The project consists of Delayed Coker Unit, Coke Naphtha HDT Unit, Sulfur Recovery Unit, etc.

ECOVAP, a joint venture composed of TOYO, OAS, and SETAL, is carrying out the project in Sao Jose dos Campos, State of Sao Paulo.

●Leftovers zero campaign

Project workers usually lunch at the cafeteria operated by an ECOVAP's affiliate. They used to leave a large amount of food leftovers. In February 2008, ECOVAP started a "Leftovers zero campaign" to reduce garbage, save food materials, and reduce costs.

Each worker receives a card every week. When a worker returns empty dishes without leftovers, he or she receives a stamp on the card. Those who put their fully stamped cards into a box at the end of week, receive various awards by drawing lots.

Lot drawing carried out on April 8

Even after the campaign ended in April, the workers are instructed to continue the custom of eliminating garbage.

ECOVAP distributed a card describing as follows to each of the workers to encourage them to reduce garbage.

Tips for reducing food garbage

◉Just pick the amount of food you will actually eat: Respect towards the food and someone else's work. Pick just enough food for your meal.

◉Do not dump the leftover: At home, learn hot to recycle the leftover: with beans, make soup; with rice, make biscuits; with carrots, make a stew. Overripe fruits can be turned into jam, jelly and stuffing for cakes.

◉Plan your weekly menu: By planning the weekly menu at home, defining the daily means, you can organize the weekly grocery shopping and avoid waste.

Introduction of TOYO-Owned Environment-Contributing Technologies

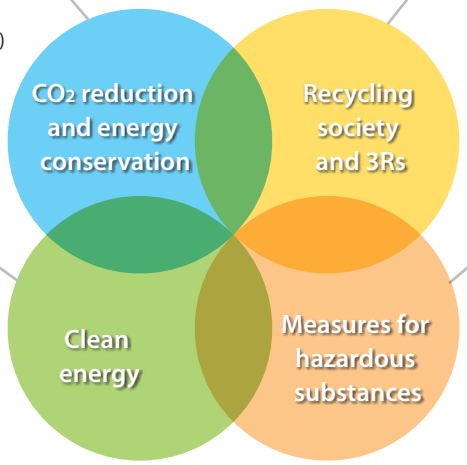
TOYO actively promotes development, introduction, and improvement of technologies on environment.

Through utilizing these technologies, TOYO provides a variety of solutions to environmental conservation and contributes to sustainable economic development, with unique engineering services in view of the global environment.

On the basis of accumulated knowledge and experience, TOYO aggressively applies R&D engineering to the field of environmental conservation, making various approaches to CO_2 reduction and energy conservation, clean energy and new energy, recycling-oriented society and Reduce, Reuse, Recycle (3Rs), and measures for hazardous substances.

(1) Energy-saving urea process (ACES21™)
(2) Energy-saving propylene-production boosting process (OCT)
(3) Highly active steam reforming catalyst (ISOP)
(4) New autothermal steam reforming process (ATR)
(5) CO_2 fixation technology
(6) Analysis and optimization technology for energy saving
(7) CDM/JI

(1) Reuse of waste water
(2) Reduced-product-loss and low-drainage-load type automated line changeover device (XY router™)
(3) Waste biomass recycling technology
(4) Sludge-volume reducing technology (using low-temperature-hydrothermal reaction)
(5) Incinerator-residue recycling technology



(1) Dimethylether (DME)
(2) Gas-to-Liquid (GTL)
(3) Hydrogen
(4) Methanol
(5) Liquefied natural gas (LNG)
(6) Biomass energy
(7) Fuel cell

(1) Electric precipitator
(2) Exhaust-gas desulfurizer using magnesium-hydroxide process
(3) High-performance waste-water treatment unit (BioPOP)
(4) Dioxin decomposing device using catalyst
(5) Hazardous waste treatment (PCB etc.)

■TOYO's Solutions to CO_2 Reduction and Energy Conservation

●Energy-Saving Urea Process (ACES21™)

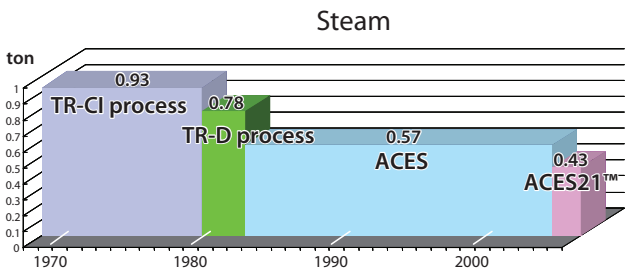
Since established in 1961, TOYO has been a leader in urea technologies worldwide, designing, engineering, constructing and commissioning almost 100 urea plants based on its own processes.

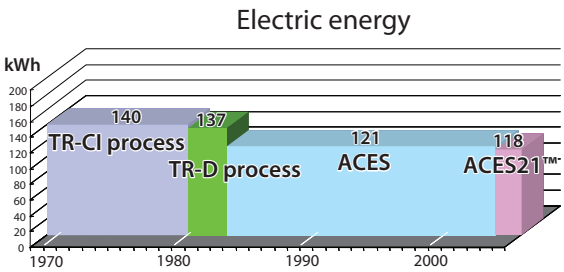

Urea product


ACES21™ urea plant

The history of urea plants is the history of energy conservation. While producing one-ton urea required 0.93 ton steam and 140 kWh electric power in the past, the newest process, ACES21™, requires only 0.43 ton steam and 118 kWh electric power to produce one-ton urea, which largely contribute to energy conservation and CO_2 reduction.

Energy consumption per ton of urea



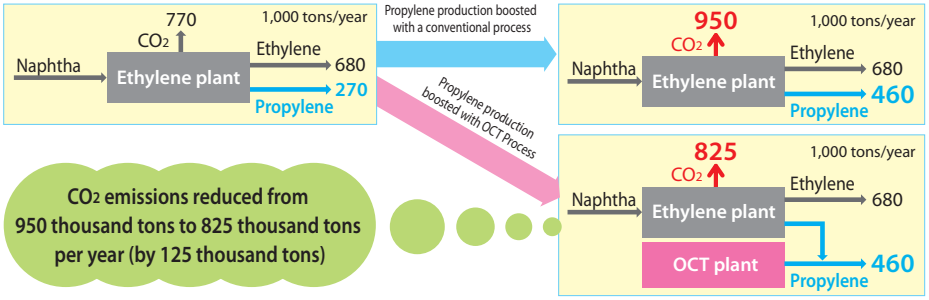


●Energy-Saving Propylene-Production Boosting Process (OCT)

TOYO, jointly with Lummus Technology, takes charge of selling Lummus' Olefins Conversion Technology (OCT) in Asian region. The OCT can boost the production of propylene at a low cost and reduce CO_2 largely when the OCT Process is integrated with an ethylene plant, so the OCT Process is expected as a new propylene boosting technology to fill up recent propylene shortage.

For example, when propylene production is increased by 190,000 tons per year, the OCT Process can reduce CO_2 by 125,000 tons per year compared to the conventional processes.

Comparison in the case of boosting propylene production by 190 thousand tons



■Utilization of CDM/JT

TOYO promotes projects utilizing Clean Development Mechanism (CDM) and Joint Implementation (JI) (note 1). We expect plural CDM/JI projects in which TOYO participates will reduce more than 1 million tons of greenhouse gases in terms of carbon dioxide per year. This gives an emission credit, contributing to reducing Japan's greenhouse emission burden.

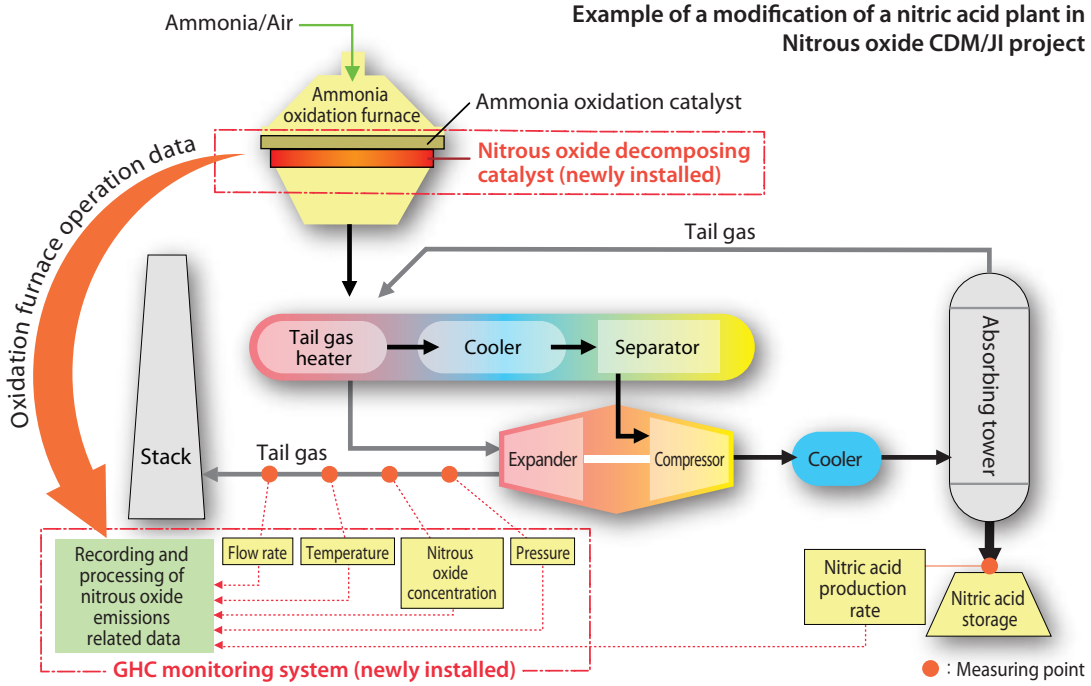
TOYO participates in projects for reducing nitrous oxide (note 2) that is discharged from nitric acid plants. As the technical adviser and system integrator for a trading firm that is the project implementing body of the Japanese side and for the plant owner of the client country such as China and Russia, TOYO offers assistance in projects for decomposing nitrous oxide into N_2 and O_2 using catalyst.

An example of a modification of a nitric acid plant in which TOYO participates is illustrated below. Newly established systems in this diagram are the nitrous oxide decomposing catalyst equipment and the GHC monitoring system. For these projects, a greenhouse gas emission and reduction data processing system uniquely developed in accordance with the United Nations' methodology is provided.

(Note 1): Clean Development Mechanism (CDM) is an arrangement allowing industrialized countries to invest in projects that reduce emissions in developing countries as an alternative to emission reductions in their own countries, that is, the countries are allowed to credit the volume of CO_2 reduced in the projects to their allocated accounts under the Kyoto Protocol. Joint Implementation (JI) is the same arrangement as CDM between industrialized countries involving Russia.

(Note 2): Nitrous oxide (N_2O) is 310 times more than carbon dioxide in terms of the global warming effect.

Example of a modification of a nitric acid plant in Nitrous oxide CDM/JI project



■TOYO's Solutions in the Field of Clean Energy

●GTL

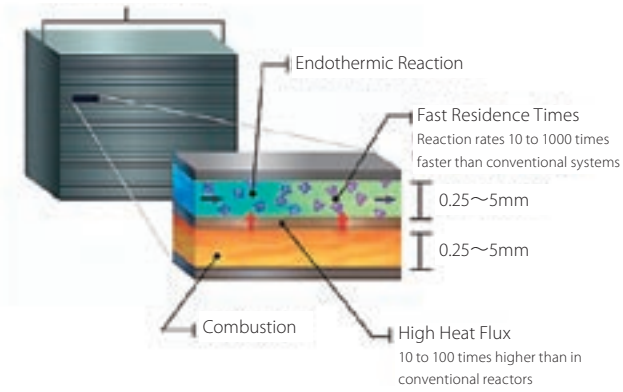
Gas to Liquids (GTL) is a process that converts natural gas into liquid fuels, mainly diesel fuel. The liquid fuels provide clean energy because they do not contain impurities such as sulfur.

TOYO has concluded an agreement for joint development and commercialization of offshore GTL plants with Mitsui Ocean Development & Engineering Co., Ltd. (MODEC) and Velocys Inc. TOYO and MODEC have been cooperating in the field of Floating Production, Storage and Offloading (FPSO) system. Velocys Inc. is a U.S.-based technology development venture, leading particularly in the field of micro-process technologies.

TOYO is developing jointly with Velocys Inc. a new GTL process using "micro-channel technology," a technology to let exothermic reaction and endothermic reaction take place simultaneously in two adjacent micro-channels. This will allow GTL production plot area to be downsized into one sixth of that of conventional system, contributing greatly to the commercialization of offshore GTL.

Offshore GTL utilizes effectively natural gas that was difficult to exploit and oil-associated gas that was discharged to the atmosphere and flared. Therefore offshore GTL contributes to environmental improvement by reducing global greenhouse gas emissions.

Velocys Reactor using micro-channel technology



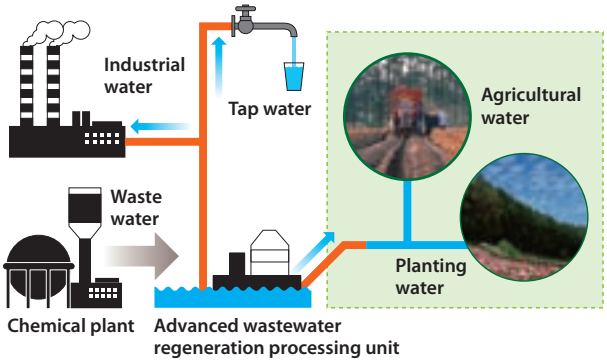
View of FPSO (provided by MODEC)

■TOYO's Solutions toward Environment-Oriented Society

●Reuse of wastewater

Reuse of industrial wastewater not only reduces the environmental load by reducing wastewater discharge, but also creates a new water resource.

TOYO has developed an "advanced wastewater regeneration processing unit" to reuse wastewater from chemical plants (right figure). The technology has been developed for DME (Dimethylether) plants, whose product is attracting attention as a new energy.

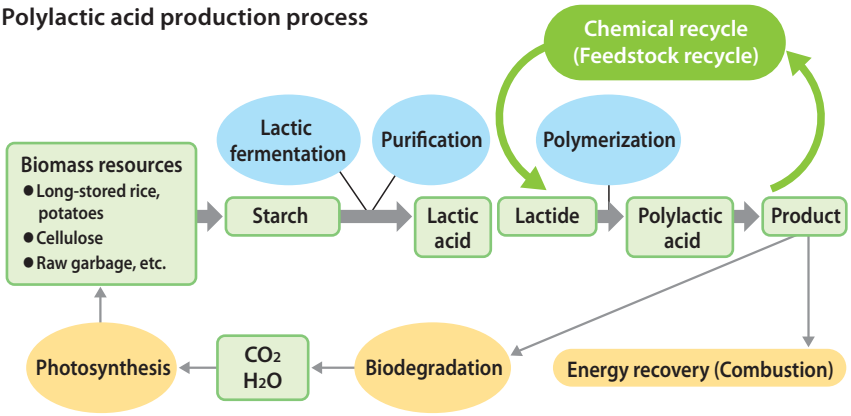


■TOYO's Solutions in the Field of Clean Energy

●Chemical recycle of polylactic acid

Polylactic acid is a biodegradable, biopolymeric material. A wide range of use is expected for packaging containers, home appliances and automobiles, fibers and others. TOYO has participated in research and development projects supported by the Ministry of Agriculture, Forestry and Fisheries in Japan, such as the production of refined lactic acid from raw garbage and the system for manufacturing polylactic acid from saccharide sulfates derived from waste wood. We have constructed a demonstration facility for chemical recycling (feedstock recycle) of polylactic acid in response to a request from Musashino Chemical Laboratory, Ltd.

Polylactic acid production process



Musashino Chemical Laboratory, Ltd.
Polylactic acid demonstration plant for chemical recycling (feedstock recycle)

■TOYO's Solutions Contributing to Measures for Hazardous Substances

●PCB detox treatment

Polychlorinated biphenyl, PCB for short, is widely known as a toxic substance which caused the Kanemi Incident in Japan. Since 1974, the production, the use and import of PCB have been prohibited, while the Japanese government law enacted in 2001 prescribes July 2016 as the mandatory deadline for disposal.

Among technologies for the disposal of electric equipment containing PCB such as transformers, capacitors, etc., TOYO has focused on the treatment of contaminated casing and internals (so-called "Container treatment"). Since the 1990s, TOYO has been active for detox treatment and recycling through the precision cleaning by organic solvents.

<TOYO's experience in PCB detox facilities>

Low-density PCB containing transformer container processing facility

- Kanto Area Recycle Center, started in June 2003
- Tohoku Area Recycle Center, started in January 2008
- Chubu Area Recycle Center, started in May 2008

High-density PCB waste pre-treatment facility

- PCB waste treatment center (phase I) in Kitakyushu, started in December 2004
- PCB waste treatment center (phase II) in Kitakyushu, to be started in March 2009
- PCB waste treatment center (expansion) in Muroran, to be started in September 2010