



# 2014

## Safety and Environmental Report



## Editorial Policy

- **Purpose of the report:** This report has been prepared to present information about TOYO's safety and environmental activities to stakeholders of TOYO.
- **Reference guideline:** This report has been prepared based on "Environmental Reporting Guidelines 2012" issued by the Ministry of the Environment–Government of Japan.
- **Period:** This report primarily covers the activities for fiscal year 2013 (from April 1, 2013 through March 31, 2014).
- **Scope:** This report covers the activities of all the divisions and departments and all the construction sites of TOYO.
- **Next report:** The next issue of such report is scheduled to be released by August 2015.
- **Prepared by:** Safety, Quality and Environment Management Unit / HSE Management Division  
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## Contribution to Clients and Realization of a Sustainable Global Community

We, TOYO, having set our mission as “Engineering for Sustainable Growth of the Global Community” aim to realize global society that is sustainable, contributing to our clients by conservation of the environment and harmonizing human evolution. To accomplish this during the process of performing engineering services, we consider it as our Corporate Social Responsibility (CSR) to fulfill provisions regarding quality and HSSE (Health, Safety, Security and Environment).

Especially on safety, we place the highest priority. In the process of providing business solutions to our valued customers, we take utmost care to prevent loss of valuable human life by all means. We strive to permeate to everybody in organization that during the business operation, respect to human life takes precedence over any amount of efforts, time and expenditure. We firmly believe that safety is not just related to the construction site staff but it should be imbibed as foundation to everybody in the organization.

Furthermore, while providing specialized services, TOYO is committed to energy saving and natural resources conservation designs. In addition, during construction work, we follow practices that considers reduction, minimizing and reuse of wastage, prevention of pollution and reduction of environmental impact.

In order to maximize the capability of our group companies and at the same time integrate our global operations, marching towards the creation of next generation engineering business, we will continue to challenge new frontiers.

Thus, we aim to become the most trusted “Global Leading Engineering Partner” to our clients by offering know-how, providing solutions to our client’s needs.

In this report, we have summarized our safety and environment-related activities. We would highly appreciate your frank opinion after reading this “Safety and Environmental Report 2014.”

August 2014



Katsumoto Ishibashi  
President and CEO

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# Safety



An industrial establishment promises foremost to pay attention to safety to surrounding community and society. TOYO ensures that loss of human life must be absolutely prevented and applies all efforts and initiatives to safety. The time and value for safety aspects are given top most priority.

“Safety” is the prime brand of TOYO. In order to boost this brand universally, we are strongly promoting many safety measures and shall actively strive to consolidate a firm safety culture.



## Safety Record

We would like to present TOYO's safety record 2009–2013 as follows.

The TOYO Group aims for zero accidents as a safety management objective. Hence our target is to further reduce Lost Time Incident Rate (LTIR) and Total Recordable Incident Rate (TRIR).

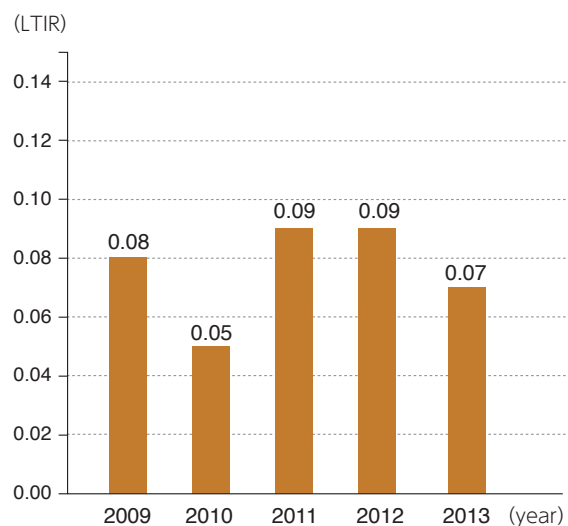
### TOYO's Safety Record over the Past 5 Years (ILO base)

Year (Jan. to Dec.)	Employee- Worked Man-Day (Thousands)	Employee- Worked Man-Hours (A) (Thousands)	Number of Incident					LTI Rate (Note 1)	Total Recordable Incident Rate (Note 2)
			Fatalities	Lost Time Incidents	Medical Treatment (No Lost Time)	LTI Total (B)	Recordable (C)		
2009	16,769	164,344	4	9	156	13	169	0.08	1.03
2010	12,012	117,295	1	5	56	6	62	0.05	0.53
2011	8,521	80,783	1	6	12	7	19	0.09	0.24
2012	12,739	120,760	3	8	16	11	27	0.09	0.22
2013	10,790	105,164	0	7	16	7	23	0.07	0.22

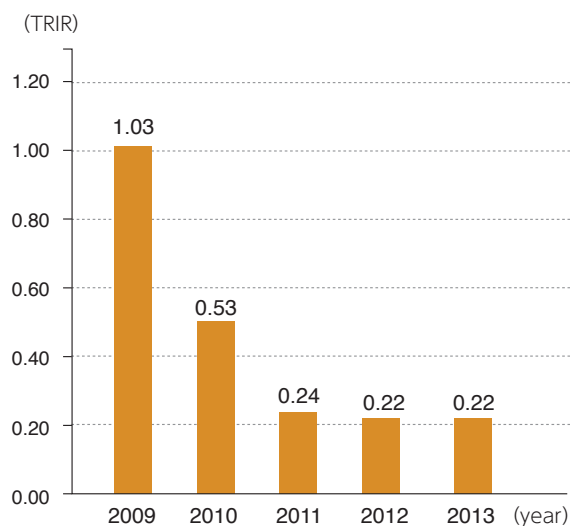
Note 1: Lost Time Incident Rate (LTIR) = (B) × 1,000,000 / (A)

Note 2: Total Recordable Incident Rate (TRIR) = (C) × 1,000,000 / (A)

### Lost Time Incident Rate (LTIR)



### Total Recordable Incident Rate (TRIR)



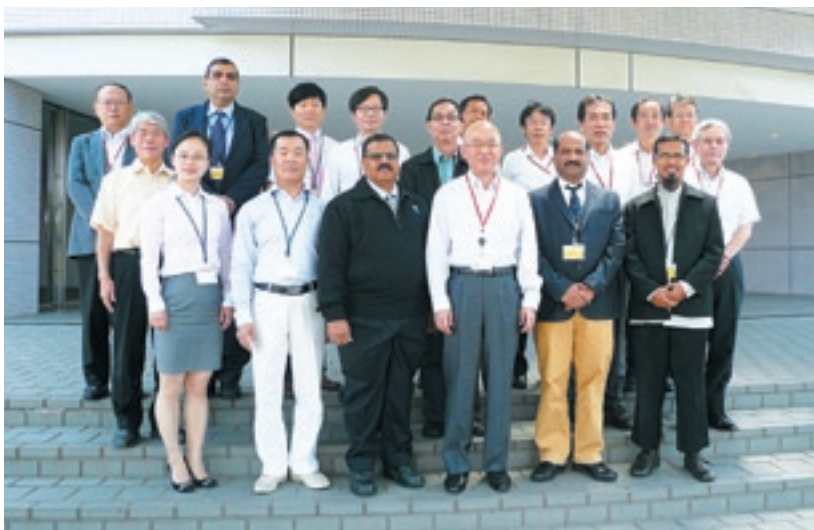


## Safety Culture in TOYO Group

### ■ TOYO Group Safety Meeting

TOYO is aiming to provide uniform level safety management irrespective of countries and regions where it operates.

In order to realize this situation, it is definitely essential to unify group companies with management leadership and promotion of safety culture within all group members supported by preparation of standard documents and its compliance. Based on this principled philosophy, the designated heads of HSSE of TOYO group companies conduct periodical meetings at pre-decided locations, exchange experience and ideas, and maintain close communication for improvement of safety management activities.



#### TOYO Group HSSE Meeting in Japan

Following TOYO group companies participated.

- Toyo-Japan
- Toyo-Korea
- Toyo-China
- Toyo-Malaysia
- Toyo-India
- IKPT (Indonesia)

# Safety

## ■ Safety Campaign

TOYO holds “Safety Campaign” at all its group companies and construction sites for promoting safety awareness for one month starting July 1 every year and various safety programs take place during this period.

### Major Campaign Program

- Message of CEO and top management of respective TOYO group company
- Display of poster, banner, flag
- Training of personal protection equipment
- Introduction of safety activities in relation with accident at construction sites
- Lecture on safe/unsafe working
- Video show in safety awareness
- Morning radio exercise
- Safety Award



Training of safety belt/harness



Mass safety meeting during campaign



Rescue training



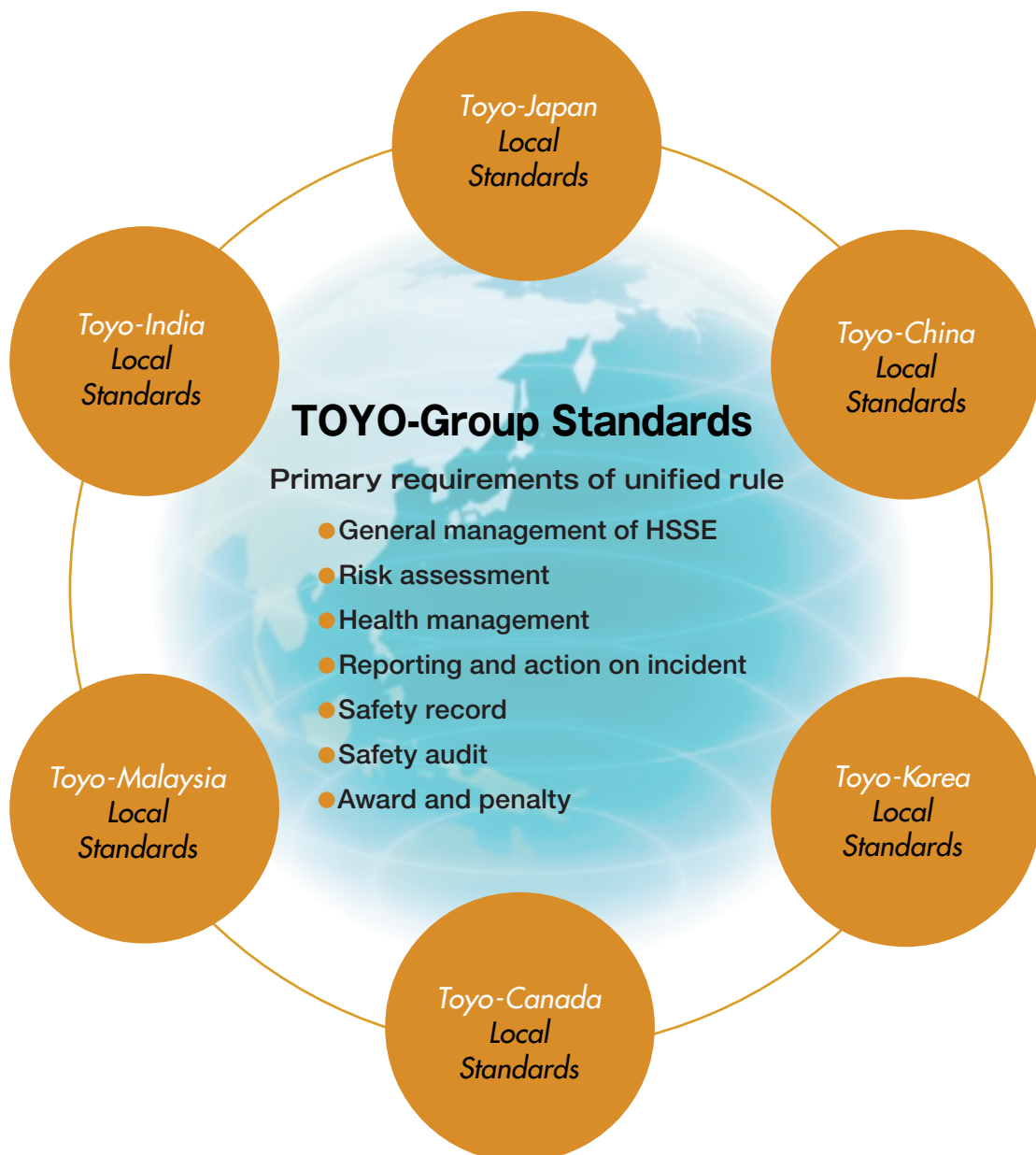
Traffic safety campaign



## Safety Management Rules

### ■ TOYO-Group Standards

TOYO establishes TOYO-Group Standards to ensure that safety management is implemented at the same level irrespective of country and region throughout TOYO group companies.







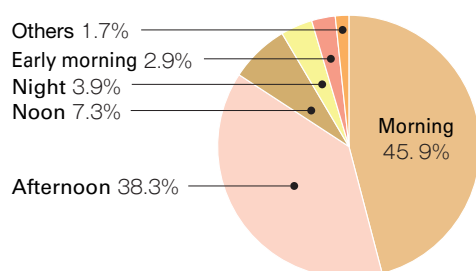
# Analysis of Near-miss Incidents (Hiyari-Hatto)

Hiyari-Hatto or “near-miss” is an incident which was prevented just before its actual occurrence to avoid a accident. It is said that frequent near-miss indicates impending serious accident.

The Hiyari-Hatto data collection and management system, developed by TOYO, has been employed since January 2008. Hiyari-Hatto data at construction sites is collected and analyzed at the Head Office, then fed back to construction sites. In the following report, 5,012 incidents from 2008 to 2013 are analyzed.

## Summary of Analysis Results

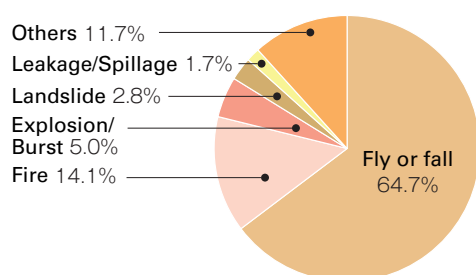
### 1 Time of Occurrence



#### Countermeasures for higher occurrence during morning

- Be sure to implement morning meeting, KYK (Note 1) and TBM (Note 2) and confirm work procedures before start of morning work
- Let all workers see around the work places to identify the conditions before work commences.
- By conducting alcohol check, avoid unsafe action

### 2 Root Cause (Material)

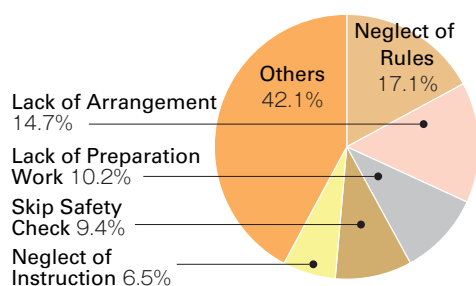


#### Countermeasures for higher occurrence

##### “Fly and Drop” accidents

- Prohibit up-down operation
- Don't leave tools and materials on floor of scaffolding
- While working at high elevations, secure tools with a rope to prevent falling down

### 3 Why Accident Was about to Happen (Human)



#### Countermeasures for preventive measure failures

- Implement one-person KY (Note 3) using KY card before starting work
- Training referring to rule and operation procedure
- After finishing day's work, encourage clean-up and house-keeping, to keep everything in order for next day

(Note 1) KYK stands for “Kiken Yochi Katsudou” (risk prediction activity), or activities for predicting work-related risks before the work is started.

(Note 2) TBM stands for “Tool Box Meeting” or activity to briefly discuss the contents, methods, arrangements, and problems of the work of the day before starting the work at the workplace.

(Note 3) One-person KY means KYK that each worker carries out prior to starting work using the “KY cards” (self-questioning cards for risk prediction).



## Lessons Learned from Accidents

Among some incidents occurred at TOYO Group construction site in the past, selected cases regarding “falling down” and “get trapped between” are reviewed below.

### ■ Falling Down

#### Situation

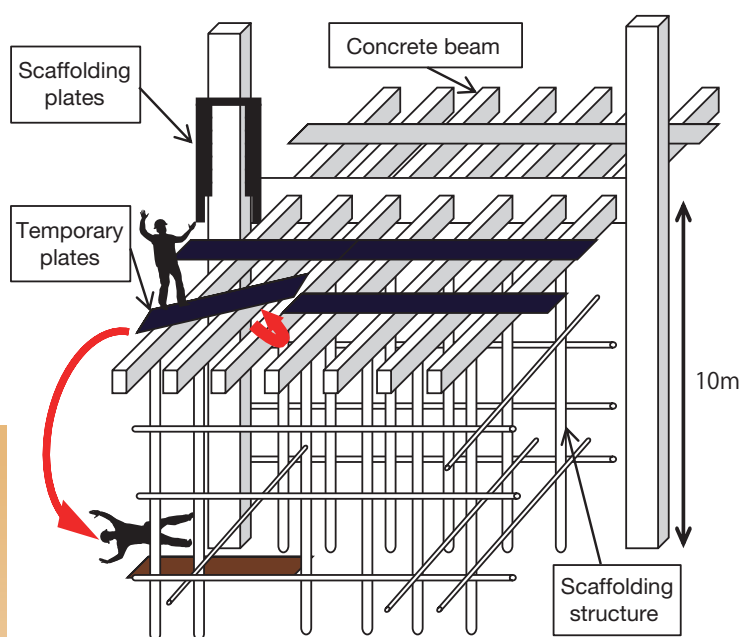
During erection of cooling tower, the incident occurred at elevation of 10m above grade level. While moving the scaffolding plank to adjacent floor, the worker fell down from temporary plates along with scaffolding plank, hitting his body to the ground. The medical examination showed dislocation of both of his wrists.

#### Causes

- Harness was used but it was single yard run and hook was detached for moving ahead.
- Walking surface was not uniform level (work place level and worker feet level were not uniform and was not checked.)

#### Countermeasures

- Safety re-orientation for working at high elevation place.
- Instruction about using of correct harness
- Inspection of all scaffolding and improve unsafe conditions
- Implementation of basic rules: rearrange, clean, tidy work place
- Sharing incident report including countermeasures for prevention of similar accidents



## ■ ■ “Get Trapped Between” Accident

### Situation

One worker was trying to move grating (square grid metal cover) in the horizontal direction for fit-up operation together with another two workers, during which his little finger got trapped between the beam and the grating and resulted in wound.

### Causes

- Improper operation procedure
- Lack of communication  
(not checking work start)
- Lack of enforcing TBM/KYK

### Countermeasures

- Routine training about work sequence and procedure
- Execution of TBM/KYK continuously
- Intensive communication before and during operation
- Elimination unsafe behavior
- Implementation of basic rules: rearrange, clean, tidy work place
- Sharing incident report including countermeasures for prevention of similar accidents



# Safety

# Environment



Considering that prevention of global warming and the preservation of the global environment are recognized as common issues facing all humanity, our group has established following ideology:

- “to contribute to sustainable development capable of both environmental protection and development of mankind.
- to contribute to environmental protection by providing engineering services in harmony with the global environment as prime international company.”

In order to realize this philosophy, TOYO will continue to resolve environmental issues of our customers actively in the future.





## Applying Technology to Preserve Environment

TOYO offers a variety of solutions to promote the development, introduction and improvement of technology to contribute to the preservation of the environment, as well as prevention of pollution of the environment and technology which are best suited to our clients.

### ■ Photovoltaic Power Plant

TOYO has been awarded a large-scale photovoltaic power plant project planned in Okayama Prefecture, Japan by Pacific Energy K.K. The plant will have a power generating capacity of approximately 32 MW and is scheduled for completion by March 2016. The power generated will be sold to major utility company, Chugoku Electric Power Co., Inc.

Photovoltaic power generation, a system that produces renewable energy, is expected to play an increasingly important role from global environment conservation viewpoint. TOYO will continue to work on photovoltaic power plant projects as part of its infrastructure business.



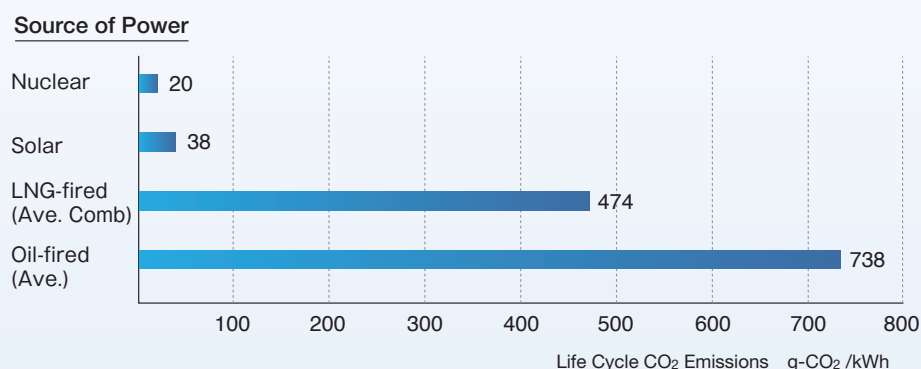
Photograph courtesy of PACIFICO ENERGY K.K.

Construction site (panels are an artistic rendering)

### Tips

#### Life Cycle CO<sub>2</sub> (Note) in Solar Power Plant

CO<sub>2</sub> emissions during life cycle of solar power plant is less than a small percent compared to oil-fired and LNG-fired power plants. CO<sub>2</sub> emissions of nuclear and solar power plants during power generation is zero.



(Note): Life cycle CO<sub>2</sub> means total amount of CO<sub>2</sub> produced in all process (of mining/refining raw material, fabrication, transport/installation, power generation, dismantling, and disposal) divided total amount of power generation in life of a power plant. Plant life is considered as 30 years for solar and 40 years for other types of power plants.

(Source): General Incorporated Foundations/Central Research Institute of Electric Power Industry/Mr. Eiichi Imamura/CRIEPI Report Evaluation of Life Cycle CO<sub>2</sub> Emissions of Power Generation Technologies Update for State-of-the-art Plants, Fig 4.1 Life Cycle CO<sub>2</sub> Emissions of Power Generation Technologies Estimated in FY2009.

## Tips

### How much CO<sub>2</sub> does a human discharge by breathing?

CO<sub>2</sub> concentration in exhaling breath of a human being increases according to amount of exercise, from 1% during rest to 9% in heavy exercise. If we consider 3% of CO<sub>2</sub> concentration as average, then a human being is estimated to produce 19m<sup>3</sup> CO<sub>2</sub> per day.

The weight of CO<sub>2</sub> per 1m<sup>3</sup> is 1.8kg. When CO<sub>2</sub> density is 3%, then weight of CO<sub>2</sub> is calculated 1kg per day and 40g per hour.

Source: Web homepage/National Institute for Environmental Studies/Center for Global Environmental Research



# Environment

## ■ Urea Process (ACES21®)

Urea fills that role as a common type of nitrogen fertilizer produced by reaction of ammonia and  $\text{CO}_2$ . It is used not only as fertilizer but also as a raw material for the industrial production of resins, adhesives, etc. Urea is also used as a deNOx agent by selective catalytic reaction for controlling gaseous emission of diesel engines. Demand of urea fertilizer is increasing day by day.

Urea is an extremely important chemical product for solving world food shortages, environmental and energy issues.



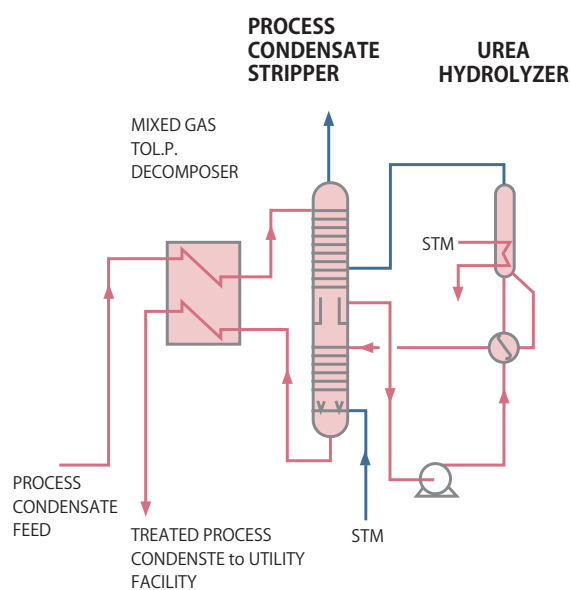
Urea product



Urea plant Pupuk Kujang Ltd.

### Pollution Control Technology for Effluent

The process condensate containing urea and ammonia from a urea plant is treated to reduce urea and ammonia of 1ppm each in process condensate treatment unit (stripper & hydrolyzer). Treated process condensate is recovered as boiler feed water in a utility facility. Therefore, there is no effluent from TOYO's urea plant during normal operation.



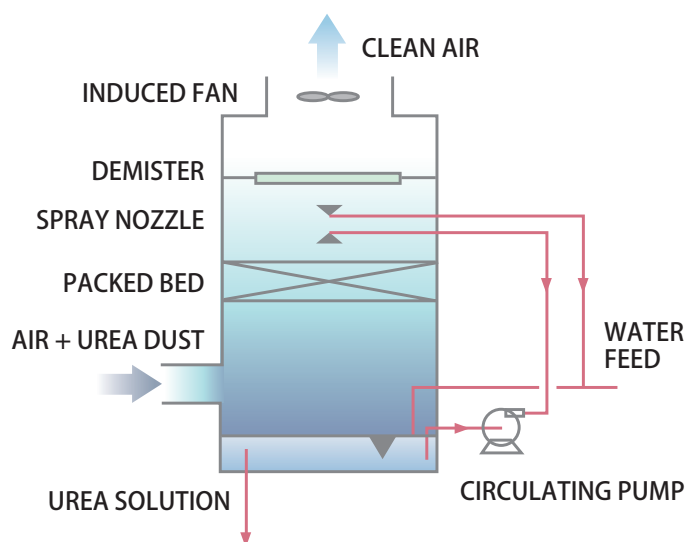
Flow scheme of process condensate treatment unit

## Pollution Control Technology for Emission

Exhaust air from prilling tower or granulation unit containing urea dust is treated in dust scrubbing system and sent out to atmosphere to less than  $30\text{mg}/\text{Nm}^3$  of urea dust.

The ammonia in exhaust air is reduced to less than  $20\text{mg}/\text{Nm}^3$  by introducing acid to dust scrubbing system.

(Reference: World Bank Group/International Finance Corporation/Environmental, Health, and Safety (EHS) Guidelines specify emission for urea:  $50\text{mg}/\text{Nm}^3$ , ammonia:  $50\text{mg}/\text{Nm}^3$ )



Flow scheme of dust scrubbing system



## ■ Plant Rejuvenation & Revamp by Optimum Engineering

TOYO (consortium of Toyo-Japan and Toyo-Malaysia) executes rejuvenation revamp project number 4 (PRR4 project) for PETRONAS Gas Berhad (PGB). PRR4 is a project to rejuvenate the forth PGB's gas processing plant at 250 mmscfd located in Kerteh, Terengganu, Malaysia. The scope of the project for TOYO is a turnkey lump-sum including engineering, procurement, construction and commissioning.

The objective of PRR4 is to extend plant life of existing gas processing plant, product gas compressor system and dew point control facility for another 20 years based on the basic design.

TOYO has conducted optimum engineering with diagnosis of exiting facility and application of integrated applied technologies and technical database developed through long experiences in plant engineering business.

As a result, the plant life extension is achieved through introduction of state-of-the-art technology, improving safety and operability and minimizing unnecessary waste and disposal. This approach is more environment conscious compared to scrapping and building a new project.



Refurbishment of flare structure and replacement of tip



Piping replacement work (only damaged portion is replaced)

# Environment



## Efforts for Reducing Environmental Load

### ■ Efforts in Office (\*1) to Save Energy and Resources

\*1: Office means Head Office and Engineering Center in Japan.

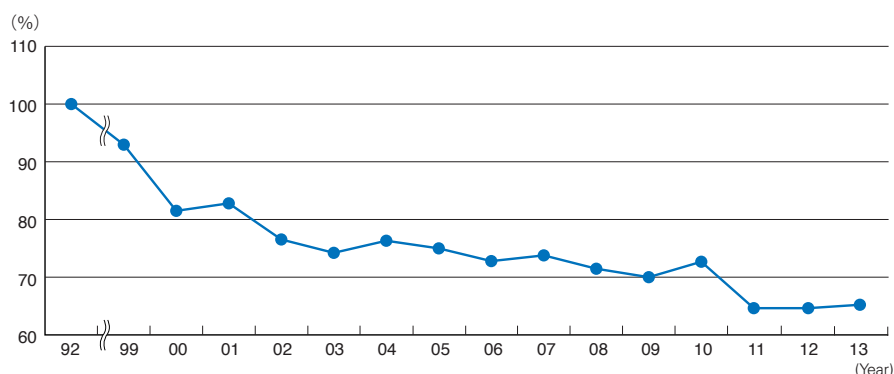
#### Reduction of CO<sub>2</sub> emissions

CO<sub>2</sub> emissions from office are calculated based on electricity consumption, fuel gas consumption (supplied by cooking gas utility company network) and consumption of fuel oil used for emergency power generation by DEG set.

Toyo-Japan launched more energy-saving efforts activities from year 2000 with office lights being turned off during lunch breaks, removal of lights deemed unnecessary and energy saving investments, such as installing lighting inverter stabilizers.

As result, CO<sub>2</sub> emissions were reduced by 35% compared to the 1992 level.

Relative CO<sub>2</sub> Emissions (%)



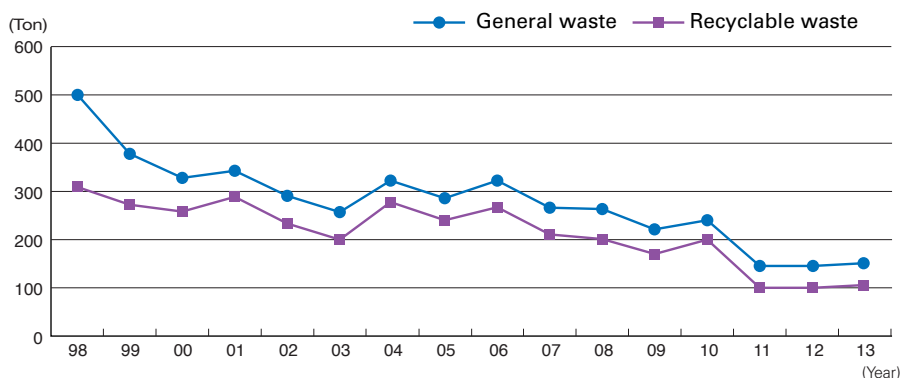
#### Reduction of general waste and recyclable waste (\*2)

Resource conservation efforts in office includes promoting both-side-copy and printing, strict separation of general waste before disposal.

Disposal of general and recyclable waste is reduced to 160 ton and 114 ton respectively and reduction of 68% and 65% respectively comparing to year 1998.

\*2: Recyclable waste is the waste including paper prints, output from personal computer and photo-copy machines, newspaper, glass bottles and cans.

Discharge of General Waste and Recycle Waste (Ton)



## ■ Construction Waste Disposal

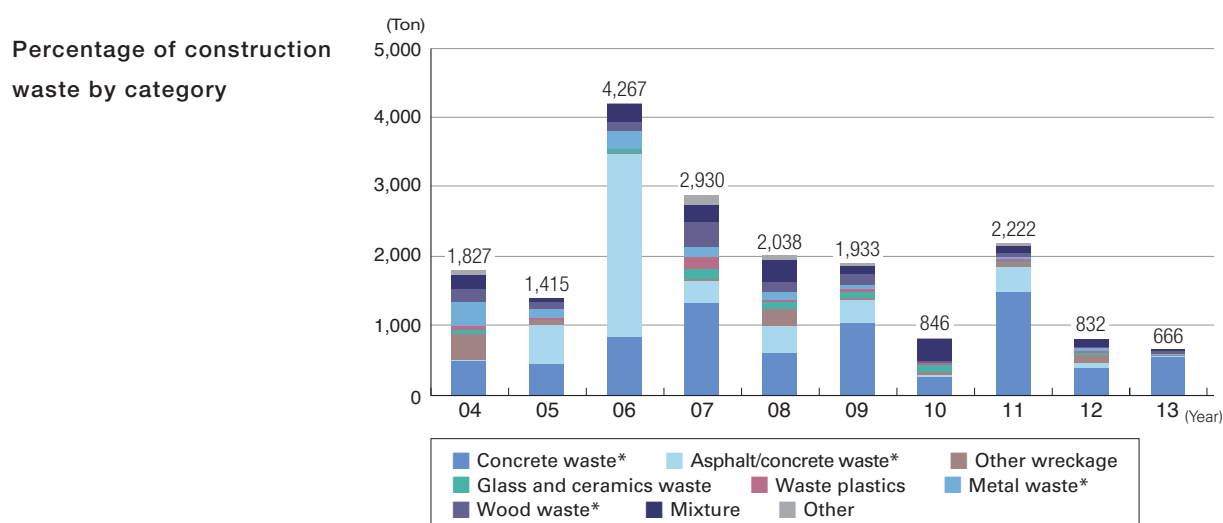
### Project sites in Japan

#### 1 Percentage of construction waste by category

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

Toyo-Japan undertakes various kinds of construction work and percentage of waste by category tends to be different in each year.

The four categories of waste marked with (\*) an asterisk are recyclable.

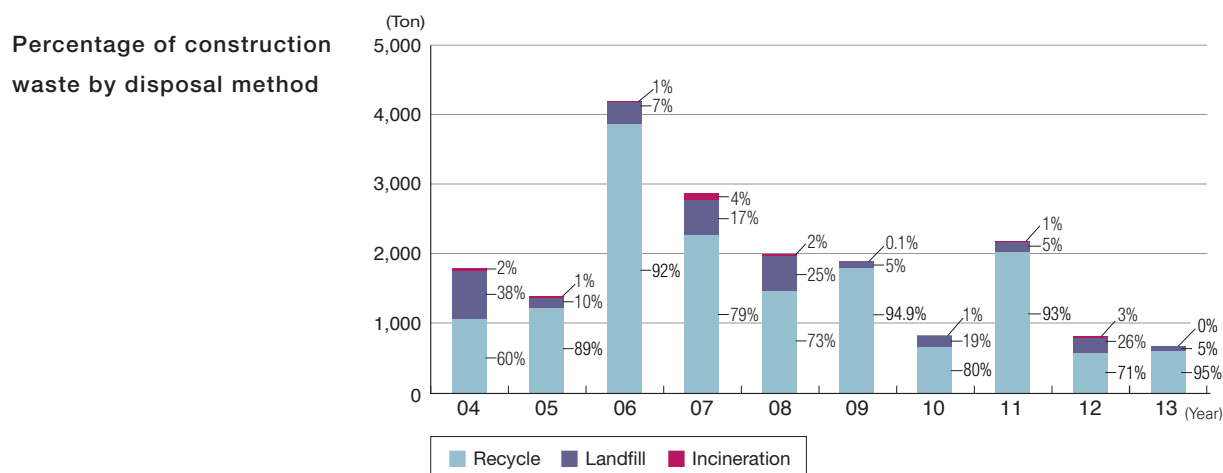


#### 2 Percentage of construction waste by disposal method

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

For year 2013, it was 95% recycle, 5% landfill and 0% incineration waste.

During year 2013, due to increasing recyclable concrete waste and wood waste, recycle ratio is higher than past year.



## Overseas project sites

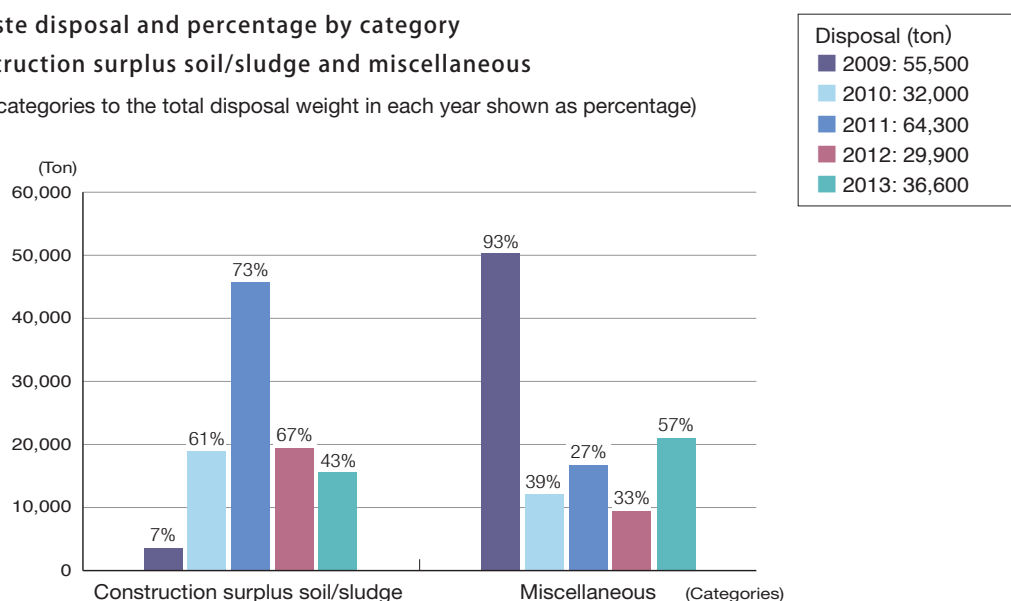
### Weight of construction waste disposal and percentage by category

The total construction disposal weight in 2013 (Jan. to Dec. 2013) was 36,600 tons. Ratio of construction surplus soil/sludge and miscellaneous is 43% and 57%.

### Weight of construction waste disposal and percentage by category

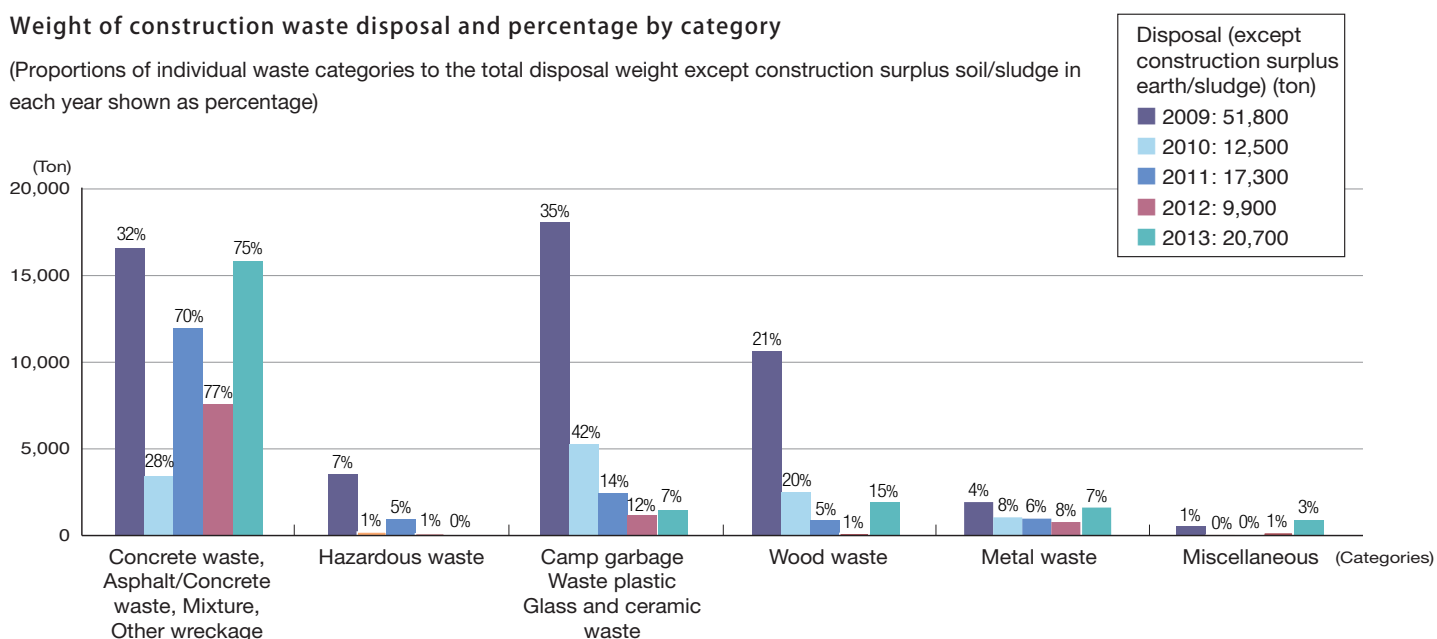
#### Comparison between construction surplus soil/sludge and miscellaneous

(Proportions of individual waste categories to the total disposal weight in each year shown as percentage)



### Weight of construction waste disposal and percentage by category

(Proportions of individual waste categories to the total disposal weight except construction surplus soil/sludge in each year shown as percentage)



The weight of construction waste disposal in year 2013, except construction surplus soil/sludge was 20,700 tons, and total disposal weights were increased because of the increase of total construction volume by the increase of project orders.

TOYO will continue to summarize construction waste disposal weights to utilize the data for reducing environmental load.



# Safety and Environmental Activities of TOYO Group Companies

## ■ Toyo-Canada

Toyo-Canada received a “Certificate of Recognition” in fiscal 2013 on HSE Management System from the Alberta Construction Safety Association.<sup>(Note)</sup>

Note: Association which consists of members in the construction business that promotes and supports safety education in the province of Alberta.

Certificate of Recognition



## ■ IKPT (Indonesia)

IKPT has implemented SHE training to all persons who would be mobilized long term or sent on business trips to work sites. SHE PASSPORT is issued to persons who complete training successfully. As a rule, people are not permitted to enter construction site without a SHE PASSPORT.



## ■ EBR (Brazil)

EBR – Estaleiros do Brasil Ltda., a TOYO group related company, received an Award for Quality and Sustainability.

This award was hosted by SINAVAL, the National Union of Marine and Offshore Construction, and assented by Petrobras, and other companies. The ceremony took place in December 2013 in Rio de Janeiro, Brazil.

The award is in recognition of the effort towards environmental protection focusing on the achievement of Green Building Code in construction of a shipyard in Rio Grande do Sul.



Awards Ceremony



Image of Shipyard



Protected Tuco-tuco (Related to rats)

# SQE Management Promotion Structure

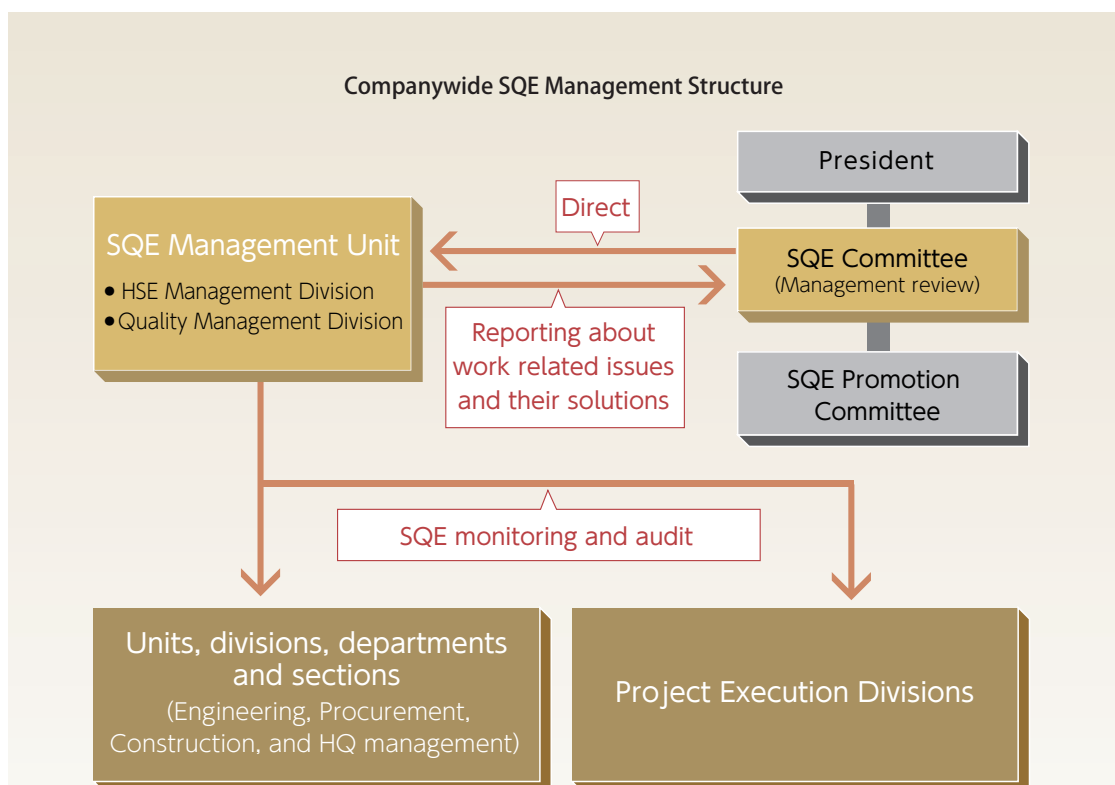
## ■ Safety, Quality and Environment (SQE) Management Structure

TOYO has set up the SQE Committee, which report directly to the President, to review companywide SQE management activities. The Committee establishes the operating policies and assesses and approves the results of SQE activities.

The SQE Promotion Committee promotes companywide activities in line with the basic policy of SQE committee, and also promotes specific SQE activities of individual Operating Divisions and individual Project Execution Divisions.

The SQE Management Unit monitors the SQE activities performed by individual Operating Divisions and individual Project Execution Divisions, conducts SQE audits and reports the audit results to the SQE Promotion Committee and the SQE Committee.

The SQE Promotion Committee and the SQE Management Unit cooperate systematically on the axis of SQE Committee, which is connected directly to the management, to implement the PDCA cycle of the individual Operating Divisions and individual Project Execution Divisions, for continual improvement of the SQE management system and performance.



## Basic Policies on Health, Safety, Security and Environmental (HSSE) and Quality

Toyo Engineering Corporation and its group companies (hereafter TOYO) recognize that satisfying the HSSE and quality requirements called for by our clients and society is an indispensable prerequisite for us to conduct business activities and to fulfill social responsibilities, and abide by the following eight basic policies.

1. Continuously confirm and share the consensus that "Safety takes precedence over all other considerations," and realize and maintain safe, sanitary conditions in all workplaces.
2. Strive to complete all jobs with no accidents and no harm to people by enforcing preventive safety measures.
3. Endeavor to provide our personnel with work environment and opportunities that enable them to maintain and improve their mental and physical health.
4. Ensure information security, and take appropriate safeguards against threats and risks to business assets.
5. Minimize environmental burden by saving resources and energy, detoxifying, reducing and recycling waste, and by preventing pollution during the course of our work duties.
6. Provide high-quality products and services that meet the HSSE requirements of our clients and society.
7. Comply with all relevant laws and regulations, the requirements agreed upon with the clients, and our in-house rules relating to HSSE and quality.
8. Establish and continuously improve the effectiveness of management systems, including objective setting, hazard identification, risk evaluation, determination of countermeasures, execution control and review, and education and training, in line with management's firm belief that the securement of HSSE and quality is a prerequisite for business continuity.

These policies shall apply to all staff members of TOYO in any region and country. TOYO will also share the spirit defined by these policies with clients, business partners, and other related parties, and cooperate with them to achieve these objectives.

July 1, 2012



Katsumoto Ishibashi  
President and Chief Executive Officer



## Corporate Profile

Corporate name:	Toyo Engineering Corporation
Established:	May 1, 1961
Representative:	Katsumoto Ishibashi, President and Chief Executive Officer
Paid-in capital:	18.2 billion yen
Number of employees:	4,747 (consolidated, as of March 31, 2014)
Business activities:	<p>Engineering, Procurement and Construction for Industrial Facilities</p> <ul style="list-style-type: none"> <li>• R&amp;D support, design, engineering, procurement, construction, commissioning and technical assistance for industrial facilities: oil, gas, petrochemicals, chemicals, water treatment, transportation systems, power generation, nuclear power, advanced production systems, pharmaceutical, fine chemical, distribution systems, biotechnology, environmental and others</li> <li>• IT engineering services and system software supply</li> </ul>

### Worldwide Network



### 〈TOYO Group Companies〉

Toyo-Japan	: Toyo Engineering Corporation
TPS	: TEC Project Services Corporation
Toyo-Korea	: Toyo Engineering Korea Limited
Toyo-China	: Toyo Engineering Corporation, China
Toyo-Malaysia	: Toyo Engineering & Construction Sdn. Bhd.
Toyo-India	: Toyo Engineering India Limited
SATEC	: Saudi Toyo Engineering Company
IKPT	: PT. Inti Karya Persada Tehnik

Toyo-Europe	: Toyo Engineering Europe, S.r.l
Toyo-Canada	: Toyo Engineering Canada Ltd.
Toyo-U.S.A.	: Toyo U.S.A., Inc.
Toyo-Venezuela	: Toyo Ingenieria de Venezuela, C.A.

### 〈Other Affiliates〉

TSPI	: TS Participações e Investimentos S.A.
Toyo-Thai	: Toyo-Thai Corporation Public Company Limited



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