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Round Table Conference

Actualizing Clients' Plans with Evolving Project Management

Increasingly Advanced Project Management —Larger scale, more sophistication

Recently, project management has advanced along with the diversifying needs of clients. How is project management changing?

Mr. Koshikawa: Over the past few years, the scale of projects has increased sharply. When we first joined TOYO, mainstream ethylene plants had about 300,000 tons of annual capacity. Today, ethylene plants usually have over 1,000,000 tons of capacity. In May 2010, TOYO completed one such plant for Shell Eastern Petroleum (Pte) Ltd., in Singapore at a cost of over $2 billion. With projects this big, the level of project management shifts from individual management skills to organizational management. We have to demonstrate strong leadership to maintain a high degree of motivation while keeping the entire organization moving in the same direction.

As projects become larger in scale, they are not executed by just one engineering company handling all operations, but in a joint venture or consortium style involving multiple companies. With the Singapore project, we used a joint venture style. Our first concern in managing this project was to deal with all employees on a fair basis and not differentiate between TOYO employees and those of our partners. It was essential to bring all workers together and get them to work "for the project," so we couldn't put the interests of the Group members ahead of our partners. The lifestyles and corporate cultures of our partners were different, particularly with European and U.S. companies. While we had to openly discuss working methods because

Project management capability is an important asset that is the core element of an engineering company. In the following roundtable discussion, we asked six project heads how they were adapting their project management capabilities to meet the demands of diversifying, progressive clients.

From the left:
Shoji Koshikawa, Itsuya Yanagi, Shigeyuki Imai, Yoshiyuki Sato, Koji Kojima, Tadashi Tamaki

of these differences, it was important to respect each other's viewpoints.

Mr. Yanagi: We are in the middle of a gigantic project to build a Gas to Liquid (GTL) liquid processing unit for Qatar Shell GTL Limited, a joint venture between Qatar Petroleum and Shell. The total plant area is over 1.5 square kilometers. The overall project is divided into eight packages, with a different contractor assigned for each package. Therefore, in addition to the difficulties arising from being a very large and complex project, the need to achieve a smooth interface among the contractors has further increased the degree of difficultly for project management. TOYO is working on the construction of one of the three processing plants through a consortium with Hyundai Engineering and Construction Co., Ltd. The more companies involved, the more complex management becomes.

Recently, even with lump-sum turnkey projects, there has been increasing client demand for engineering companies to be accountable in the same manner as with cost reimbursable basis projects. When I was working on projects 20 years ago, mainly in Southeast Asia, TOYO's standard was used as the project standard, and our engineering and construction work was based on that standard. Today, that is no longer the case. To satisfy clients, we must constantly work hand-in-hand with them.

Mr. Imai: Currently, I'm in charge of working with TOYO's clients in Japan. Most of the projects are domestic and the scale is relatively small. Recently, however, there has been an increase in the number of clients investing overseas, giving us the opportunity to help them in starting up operations overseas. Up to now, TOYO has assisted clients with a total of 180 startup projects in China and other countries.

On these startup projects, our support is not limited to only engineering and construction. We also work closely with the client in selecting a location for the plant, making applications for various permits and licenses, and producing the basic plan. We take steps to ensure the smooth progress of each client's capital investment project, utilizing our know-how and network to achieve an early start to business operations. I try to make sure that our clients are aware of TOYO's significant project implementation capabilities in this regard.

Mr. Sato: In one of my projects, TOYO is working jointly with a European engineering company on a Dow Corning (Zhangjiangang) Co., Ltd., project in China. The project has reminded me that companies have different corporate cultures. In TOYO's case, our engineers on the project have a great deal of experience with working on lump-sum turnkey basis projects. They take the initiative on the project, assuming responsibility by remaining constantly aware of cost and schedule. Therefore, the project manager only has to control the overall aspects of their efforts. On the other hand, the focus of the European engineering company is on the project manager demonstrating leadership in cost, schedule, and quality control to ensure the performance of all engineers and subcontractors. To resolve this gap in approaches, we discussed this issue continuously for many months until we reached an agreement on a uniform approach. Today, it is becoming increasingly important to use management methods that accept a variety of differences in cultures.

One impression I received from many projects is that constant awareness of a lump sum goal is necessary even with cost reimbursable basis projects. Engineering contractors are required to work on this basis.

Shoji Koshikawa
General Manager, Overseas Project Division 1, Overseas Project Operations Unit

Profile Mr. Koshikawa entered the Company in 1980, and after gaining experience in the Construction Division and Piping Design Department, became PM of an EOEG project in Malaysia, a petrochemical plant project in China, an ethylene plant project in Singapore. In 2010, he was promoted to his current position.

Tadashi Tamaki
General Manager, Overseas Project Division 2, Overseas Project Operations Unit

Profile Mr. Tamaki entered the Company in 1977. He gained experience in the Construction Division. Then he became CM of a fertilizer project in Indonesia and a gas pipeline project in India, FM of LNG upstream facilities in Qatar and PD of an LNG project in Sakhalin, Russia. Currently, he is supervising overseas power generation projects.

Yoshiyuki Sato
General Manager, Overseas Project Division 3, Overseas Project Operations Unit

Profile Mr. Sato entered the Company in 1979, and after gaining experience in the Process Engineering Department, became PM of an ethylene project in Egypt and PM of a fluoro resin project and PD of a silane siloxane project, both in China. Currently, he is supervising a grassroots refinery project in Venezuela.

Mr. Tamaki: Nowadays, I feel that our clients' expectations have escalated to an even higher level. One of the factors is the rise of emergent engineering contractors in the market. To survive this greater competition, we have to specialize in even more complex or larger scale high-value-added projects. To that end, we have to boost our project management capabilities beyond their current levels. For example, some clients have said to me, "We could use any company and have the project completed to our specifications. We gave the order to TOYO expecting that you will provide technological ideas that go beyond our specifications." To cope with the advances in client needs, both our individual engineers and our organization will be required to strengthen their abilities.

Mr. Kojima: The ability to be "aware"—accurately grasping what clients are looking for from daily work and conversations—is important. Also, projects involve various risks, and it is impossible to address them properly unless you become aware of those risks at an early stage.

Furthermore, contributing to local communities is another role engineering companies are required to play. I was involved for five years with a project to modernize the REVAP oil refinery of Petróleo Brasileiro S.A. (PETROBRAS). The project contract required TOYO to procure at least 79% of its Engineering, Procurement, and Construction (EPC) materials and services locally. This local content rule was set in accordance with a Brazilian government policy aimed at developing local industries. Despite strict criteria, such as the exclusion of equipment ordered from local companies if imported materials were used, we managed to maintain a local content ratio of 80% or more. This achievement owed to our experience from the continuous implementation of projects in Brazil.

Sustainability and Contribution to Local Communities —A new perspective

Recently, many clients have been giving high priority in project execution to fulfilling their corporate social responsibilities, such as safety and environmental conservation. How are you tackling this issue in projects?

Mr. Koshikawa: Look at the major oil spill in the United States last year. No matter how good your business performance has been, one accident is all it takes to severely damage a company. While the construction of plants stimulates the economy of a country or a region, there is the constant risk of an accident or disaster. Therefore, ensuring safety and taking the environment into consideration are more important than ever in our projects.

We take great care with onsite job safety as well. During the peak period of the ethylene plant project in Singapore, we had more than 10,000 workers on the site. Still, we set our sights on zero incidents and took all possible safety measures. In September 2009, we reached a record of 39 million man-hours without an accident, which was highly evaluated by the client.

Mr. Tamaki: We also paid attention to every detail regarding safety during the construction of an LNG plant in Sakhalin, Russia. For example, even for the scaffolding, the client set standards that went beyond Russian standards or Japanese JIS standards. To ensure thorough awareness of safety on the project, we held a monthly party jointly with the client to which we invited workers and construction management staff and awarded safety commendations.

Safety awareness is a culture—and it requires persistent efforts to get that culture to spread into the many different cultures of those working on a project.

On the environmental front, the conservation of the vast wilderness surrounding the construction site was the major issue. We implemented many different measures, from ecological surveys of pink salmon, migratory birds, and other creatures, to planning greenery for the site. Moreover, we focused on contributing to the region through building a training school and developing engineering and technical skills among the workers as the project proceeded. In this manner, clients are placing greater emphasis on sustainable development in recent projects.

Mr. Sato: To maintain safety, management has to show leadership by taking the initiative. However, it's no use if only the project managers raise a clamor about safety. It is essential for each of the workers on the site to change their thinking about safety. For example, on the project in China, staff members pointed out unsafe work practices at the site and gave suggestions on correcting them. They wrote these suggestions on an "Intervention Card" which was passed on to workers so everyone could understand the value of these practices and change their work habits. Not only did those in charge of safety fill out and pass around the card, but also construction supervisors, project managers, and engineering project team members. In this way, project safety awareness reached each of the onsite workers. By thoroughly correcting minor unsafe working practices on a daily basis, it was possible to notably lower the occurrence rate for major incidences. Over the entire project, we were able to achieve a total of 20 million man-hours without a lost time incident. We have to vigilantly implement safety measures and constantly work to make the site safe—that is TOYO's project management policy.

Being Trusted by Clients as an Engineering Partner

TOYO's goal is "becoming a Global Leading Engineering Partner." What do you think TOYO is doing to fulfill the expectations of clients or to respond to their needs—or what do you feel TOYO should be doing?

Mr. Yanagi: In the Qatar GTL project, we concentrated all our energies on quickly building a relationship of trust between ourselves and our clients and our consortium partner. From start to finish, our clients took the position that transparency was the first priority. In response, TOYO insisted that project members quickly disclose information under the slogan "Bad News—OK, Bad Surprise—NO." TOYO has five values that make up its code of conduct for employees. Of these values, I use "Integrity" as my perspective for placing emphasis on transparency in operations and taking responsibility in explaining our actions.

Mr. Sato: Especially with cost reimbursable projects, clients pursue a high performance target and even better project implementation. While we have to recognize the risks and of course make careful preparations to deal with them, if we always stay on the defensive in projects, there will be no progress. I believe it is important to try and meet the client's demands.

During the project in China, we maximized the amount of engineering done locally, minimized the involvement of non-nationals in engineering and construction management, procured all of the needed 12,000 metric tons of steel materials in China, and procured installation services for heavy equipment

Koji Kojima

General Manager, Overseas Project Division 4, Overseas Project Operations Unit

Profile Mr. Kojima entered the Company in 1979. He gained experience in the Construction Division and Piping Design Department. Then he became PM of a petrochemical project in Thailand and of a refinery modernization project in Brazil. Currently, he is supervising all projects in Brazil.

Itsuya Yanagi

General Manager, Overseas Project Division 3, Overseas Project Operations Unit

Profile Mr. Yanagi entered the Company in 1978, and after gaining experience in the Construction Division, he became PM of an ethylene expansion project in Thailand, of a pipeline project in Azerbaijan, and of other projects. Currently, he is supervising a GTL project in Qatar.

Shigeyuki Imai

General Manager, Domestic Project Division, Domestic Sales and Operations Unit

Profile Mr. Imai entered the Company in 1976 and he was posted in the Construction Division. In 1996, he was transferred to the Project Division. After gaining experience as PM of a monorail project in Malaysia, he became Managing Director of Toyo-Malaysia. Since 2009, he has been supervising the Domestic Sales Operations Unit.

PM: Project Manager CM: Construction Manager
FM: Field Manager PD: Project Director

from local contractors. We cleared many difficult hurdles in successfully completing the project in accordance with the client's demands. I think steadily meeting challenges in this way rather than taking the traditional course will promote advances and diversification in TOYO's project execution.

Mr. Koshikawa: The ethylene plant in Singapore was a cost reimbursable basis project, which can be likened to a custom built house. It is important to get as close as possible to the client's concept. To do so requires wide-ranging knowledge and problem-solving capabilities. I think a client's trust can be won by continuing to diligently provide proposals and explanations. It's a big boost for a manager when a client says, "I can sleep well at nights knowing you are in charge."

Mr. Tamaki: To achieve maximum client satisfaction, we have to be flexible in changing our management methods depending upon the features of projects. For example, with the electric power generation projects I am in charge of, the main focus of management is quite different than with the hydrocarbon types of plants TOYO usually specializes in. The portion of such major equipment as gas or steam turbines that comes as a package is high, leaving little room for discretionary engineering development by TOYO. Further, we have to minimize the use of our staff and establish a streamlined organization.

At our current ongoing power generation project in Thailand, we are simultaneously constructing the plants at seven sites in the suburbs of Bangkok. Consequently, an engineering center and a project management center were established in Bangkok so as to efficiently control all of the construction sites.

Mr. Kojima: With projects in emerging nations like Brazil, there is a tendency to have trouble acquiring resources in the amounts and quality needed. Materials also are relatively scarce, and in some cases, so is manpower, such as engineers and construction workers. For example, on one oil refinery project, we couldn't find enough skilled welders. To solve the problem, we started a training school for welders and educated local workers. In staying strictly on schedule and meeting the expectations of clients in emerging countries, resource acquisition and application will continue to be important issues.

Mr. Imai: The key to client satisfaction for Japanese clients that are starting up operations overseas is providing them with services adapted to the relevant country or region.

China has famous industrial parks, such as Zhangjiagang and Nantong, where foreign companies congregate, and many TOYO projects are concentrated in these regions. Japanese companies thinking of expanding into China come to these industrial parks and hear about TOYO's reputation in China from Japanese companies already operating there. There have been cases where that exchange of information has led to new contracts for TOYO. We have put together teams that are very familiar with individual local regions and have carried out detailed local surveys. We also have developed know-how on commercializing a business locally and can act as a company's agent to establish companies in each region. Having these overall capabilities reassures clients.

Continuing to Face the Challenges of Diversifying Issues —The evolution of project management

Please tell us what you think TOYO should be aiming for in project management in the future.

Mr. Tamaki: The project management of engineering companies consists of doing constantly changing work using a specific project organization. Nevertheless, we have to target uniform quality and sophistication by doing our best to normalize the work. In my view, TOYO's project management will progress further in this direction.

TOYO expects the infrastructure field, which includes the power generation market, to become one of the cores of its business. For the near future, entering the consulting and basic planning area of the power generation businesses, I look forward to leveraging our Global Toyo resources to develop our power generation business.

Mr. Koshikawa: I believe that the TOYO mindset of being fully dedicated to providing clients with what they want has extremely high value in the market. TOYO's zeal for doing what it takes to fulfill the expectations and wishes of its highly valued clients is one of the best aspects of the Company. On the other hand, we have learned a lot from European and U.S. contractors regarding logical thinking and presentation. Right now, our clients and markets are rapidly changing. Under the concept of "Japanese Spirit and Skills Combined with Western Learning," whereby we will fuse our traditional Japanese mindset and engineering skills with logical thinking, I plan to provide clients with proposals that maximize the value clients expect from a project.

Mr. Imai: The number of domestic clients in Japan is limited. Therefore, in conjunction with developing new clients, winning repeat work from clients will be the way to build business in the future. For that purpose, it will be important to clearly demonstrate the special skills of engineering contractors as an intermediary between clients and business partners, such as manufacturers and subcontractors—in other words, prove our functional value.

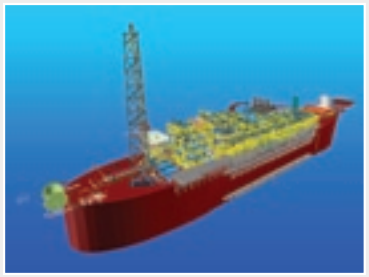
I was in charge of a project in Malaysia where I gained the impression that the manufacturer had great pride in its technology and products and was mainly interested in having those products used in the project. Considering the real needs of the client in developing the optimal proposal for the project was left up to TOYO. Consequently, I think we have to further reinforce our main ability as an engineering company—coordinating the project consistently from a client-oriented perspective and from the standpoint of achieving the client's wishes.

Mr. Sato: The days when Toyo-Japan carried out all project execution are gone. We have entered the era of global execution, where projects are executed by combining the resources of the entire Group—Toyo-India, Toyo-Korea, and other companies. Moreover, it is essential that we show leadership that brings out the best capabilities of local business partners outside the Group. I plan to globally disseminate TOYO quality by further refining TOYO's traditional superior teamwork and our sense of mission in completing projects successfully.

Mr. Kojima: The management's ability to completely control complex projects, where multiple contractors are executing the project, will become increasingly important. In Brazil, there is a lot of activity in the lead up to the 2014 FIFA World Cup and the 2016 Rio de Janeiro Olympics. As a result, we expect that the supply of resources and materials will be even tighter. However, I will continue to contribute to progress in Brazil's economy and society by utilizing the TOYO network that we have developed through continuous execution of projects in Brazil since 1996.

Mr. Yanagi: We are working together with two other Japanese engineering companies in Qatar, so I have had many opportunities to think about TOYO's strengths. What comes to mind is "TOYO's assets are people." In our company, employees at all levels—managers, lead engineers, young engineers, and others—endeavor to upgrade their skills daily, collaborate with the client, and drive toward a successful conclusion to the project. I believe this sincere stance of all our employees contributes strongly to TOYO achieving its ultimate goal for the project, which is client satisfaction. I hope TOYO will maintain the individualistic and competitive nature of its workforce while remaining one of the leaders in the global engineering market. ■

Agreement Reached on Floating Oil Production Facility for Brazil



In October 2010, MODEC and TOYO Offshore Production Systems Pte. Ltd., a joint venture established in Singapore by TOYO and MODEC, Inc., received a letter of intent from MODEC, regarding an order for a Floating Production Storage and Offloading (FPSO) topside facility.

The FPSO facility is to be delivered to Brazil's national oil corporation, Petróleo Brasilero S.A. (PETROBRAS). It is scheduled to be used for oil development in the BM-S-9 block of the Guará oil field. PETROBRAS holds a 45% stake in the oil field, with BG Group plc. holding a 30% stake, and Repsol YPF, S.A. holding the remaining 25% share.

Currently, engineering and procurement activities are at the peak period. Module fabrication will begin in the outskirts of Rio de Janeiro in March 2011. Lifting of the topsides module will start at the end of 2011, with completion scheduled for the end of 2012.

This order is the fourth to come out of the Group's business alliance with MODEC and marks TOYO's 26th project in Brazil. TOYO is striving to strengthen its operations in the upstream fields, such as natural resource development and FPSO facilities, and intends to further reinforce its collaboration with MODEC in the FPSO business.

Modernization Project for REVAP Oil Refinery Completed

Former president of Brazil, Luiz Inácio Lula da Silva

In October 2010, PETROBRAS held a completion ceremony for its REVAP Refinery, attended by the then president of Brazil, Luiz Inácio Lula da Silva, and the CEO of PETROBRAS.

The REVAP Refinery is located in São José dos Campos on the outskirts of São Paulo. The goals of the modernization project were to upgrade the refinery's capacity for Brazilian produced heavy crude oil, increase product quality, and reduce the refinery's impact on the environment. To achieve these goals, a delayed coker unit with a capacity of 31,500 BPSD, a coker naphtha hydrotreating unit with a capacity of 18,900 BPSD, and six other units are installed.

The project was managed by TOYO; Construtora OAS Ltd., a Brazilian general contractor; and SOG Óleo e Gás, a Brazilian engineering company. In Brazil, contractors have to procure as much material and labor from local sources as possible in accordance with a Brazilian government policy for developing domestic industry. The purchase of equipment was conducted under extremely detailed schedules. To secure skilled welders, TOYO also started a training school. An incentive system for workers was implemented to ensure that the project proceeded smoothly. These measures enabled the project to proceed successfully, and the REVAP Refinery has become a leading plant for PETROBRAS.

Completed REVAP Refinery

Brazil is developing quickly, in the lead up to the 2014 FIFA World Cup and the 2016 Rio de Janeiro Olympics. TOYO looks forward to contributing to this progress in such fields as natural resource development, oil refining, and petrochemical, fertilizer, and chemical plants.

Handover of Large-Scale Ethylene Plant in Thailand

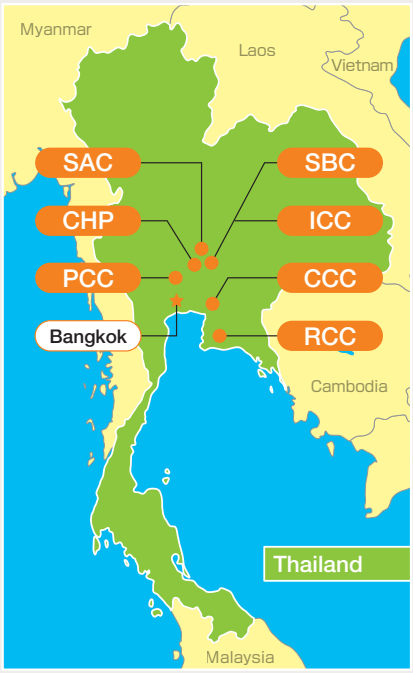
Completed ethylene plant

The ethylene plant project for PTT Polyethylene Co., Ltd., that was jointly executed by TOYO and Toyo-Thai was completed. The plant was successfully handed over to the client in December 2010. Begun in 2007, the project entered the commissioning phase in 2010, but actual commissioning of the plant was postponed due to environmental problems at the Map Ta Phut Industrial Estate where it is located. As a result, completion and delivery were delayed.

The plant is a large-scale facility with an annual production capacity of 1,000,000 tons and uses ethane gas as raw material for ethylene production. The energy efficient and cost efficient facilities employ new technology from licenser Lummus Technology, including a low-pressure cryogenic separation train, a front end acetylene converter, and a binary refrigeration system.

The project further extends TOYO's highly successful record in Thailand, a country which has recently been achieving greater than 7% economic growth.

Contract Concluded for Electric Power Generation Project in Thailand



In October 2010, TOYO and Mitsui & Co., Ltd., signed an electric power plant contract with special purpose companies wholly owned by Gulf JP Co., Ltd., an independent power producer in Thailand. Gulf JP's major shareholder is the Electric Power Development Co., Ltd., in Japan. The project will construct seven gas-fired combined cycle electric power plants at sites located in the suburbs of Bangkok. Each individual plant will have a capacity of 110 MW–120 MW for a combined power supply of 780 MW. Gulf JP awarded the supply contract to TOYO and the construction contract to Mit-Power (Thailand), Ltd., a Mitsui local company. Construction began in November 2010 and is currently in progress at six sites. The project plans to bring the seven electric power plants on stream in sequence during the period from December 2012 to October 2013.

When completed, each electric power plant will sell 90 MW of electric power to the Electricity Generating Authority of Thailand (EGAT) under Thailand's SPP Program* and the remaining 20 MW–30 MW to companies in neighboring districts. Brisk demand for electric power is expected in Thailand due to the developing economy, particularly in the industrial regions skirting Bangkok. TOYO and Mitsui will focus on electric power plants.

* Small Power Producers (SPP) Program: A program formed in Thailand in 1992 that is aimed at achieving high-efficiency energy utilization through the promotion of renewable and small hydropower generation projects.

Order Awarded for Azerbaijan Shimal 2 Gas Combined Cycle Power Plant

In December 2010, TOYO concluded a contract with Azerenerji Joint Stock Company to construct a power plant in the Republic of Azerbaijan. Azerenerji is the national power company of Azerbaijan.

The contract is to build a 400 MW gas combined cycle power plant on the outskirts of Baku, the capital of Azerbaijan. Construction was begun in February 2011 and will be completed in November 2013. TOYO is executing the project jointly with Azenco Joint Stock Company, a local construction company. Mitsubishi Heavy Industries, Ltd., will supply the major equipment—a gas turbine and a steam turbine.

TOYO received a previous order from Azerbaijan for a natural gas pipeline and compressor stations in 2002. The country awarded the current contract to TOYO as a result of its record on that project as well as a high evaluation of TOYO's broad ranging record for EPC projects around the world, including CIS countries.


Illustration of the completed Shimal power plant

The contract is based on an ODA loan agreement between Japan and Azerbaijan signed in May 2005. It is the second project for TOYO received under the agreement, following the previously mentioned pipeline construction project.

Azerbaijan is achieving high economic growth thanks to oil and gas field development in the Caspian Sea. Most of the electric power demand comes from the eastern portion of the Absheron peninsula, which includes Baku. Consequently, building this high-efficiency power plant on the outskirts of Baku will contribute to a stable and efficient energy supply in the country.

In addition to hydrocarbon projects, TOYO is actively developing its infrastructure business in such areas as electric power, water supply, and transportation. This order comes on the back of the recent order for electric power plants in Thailand, received in October 2010. Extending development of the electric power field based on the current large-scale gas combined cycle power plant order, TOYO plans to focus on power projects in emerging countries.

Toyo-China Awarded ETA Plant Order from HPC

Signing ceremony

In September 2010, Toyo-China was awarded an order from Honam Petrochemical Corporation (HPC) of Korea for an Ethanolamine (ETA) plant with an annual production of 50,000 tons. The plant is to be built in Jiaxing, Zhejiang Province, China, with completion scheduled for the first quarter of 2012.

HPC is proceeding with its entrance into the Chinese market. The ETA to be produced by the new plant will be used as a raw material for the production of pharmaceuticals, cosmetics, detergents, and other finished products. To win this order, Toyo-China bested contractors from China and Korea with a comprehensive EPC bid.

For TOYO, this is the third order awarded from HPC, following a polypropylene plant in 1977 and an ethylene plant in 1989. HPC awarded the current order to Toyo-China in recognition of its past project record and its global capabilities, including the assistance of Toyo-Korea.

Following a strategy of "advancing Global Toyo," TOYO is strengthening the collaboration of its Group companies to execute international and local projects to meet clients' diversified needs. The HPC project is just one example of offering solutions through the optimal formation of Group companies.

TOYO Appointed for FEED Work on Mid-Scale LNG Plant

TOYO and Hitachi, Ltd., have been appointed by Eastern Star Gas Limited (ESG) to undertake Front End Engineering and Design (FEED) for ESG's mid-scale electric-motor-driven LNG plant in Newcastle (LNGN). This project follows successful completion of feasibility studies in 2010, which were undertaken by TOYO and Hitachi. ESG plans to determine their investment by March 2012, and to start exporting products in 2015.

FEED work involves optimization, basic design, and detailed costing of the LNGN Project, including the LNG storage tank, jetty, and loading facilities. Gas liquefaction process will be supported by Chart Energy & Chemicals, Inc., which will provide its process technology and the core equipment.

The LNGN Project is expected to use electric-motor-driven mid-scale LNG technology with an annual production capacity of 1,000,000 tons. It is anticipated that the site will be capable of accommodating a capacity of up to 4,000,000 tons in the future. The electric-motor-driven, mid-scale, single mixed refrigerant technology offers multiple advantages, especially for LNG projects fed by CSG*; including low capital cost and faster construction; high reliability, high efficiency, and low environmental impact; operational flexibility and train size ideally suited for CSG development; and a small footprint and low noise ideal for the site location.

* Called Coal Seam Gas (CSG) in Australia, this gas is generally referred to as Coalbed Methane (CBM) and is extracted from coal seams and their surrounding areas.

Canada's Tri Ocean Engineering Joins TOYO


Tri Ocean Engineering Ltd.

In October 2010, TOYO merged Tri Ocean Engineering Ltd. in Alberta, Canada, which was purchased from ASRC Energy Services Ltd. TOYO holds 100% of the acquired company's stock.

Tri Ocean Engineering provides engineering, procurement, and project management services for oil and gas development plants including oil sands-related plants. The company also offers business alliance services as per long-term agreements for a number of major energy companies. Tri Ocean Engineering has a total of 120 employees with diverse national backgrounds.

It is expected that the growing demand for energy worldwide will increase the business opportunities in energy development for oil sands and unconventional gas sectors in Canada, as well as oil and gas well development in remote areas, such as the Arctic and other cold weather regions. In cooperation with Tri Ocean Engineering, TOYO intends to leverage its comprehensive engineering capabilities and global network in the area of its heavy oil, unconventional gas, remote, and Arctic and other cold weather development businesses.

This new Canadian company will take on an important role in Global Toyo, and will contribute to all clients, not only in the Canadian market, but also all over the world through the Global Toyo network.

Completed RFCC plant

Taiyo Oil RFCC Project Completed

The Residual Fluidized Catalytic Cracking (RFCC) project at Taiyo Oil Co., Ltd.'s Shikoku Operations was planned to promote the use of heavy oil. TOYO completed the unit in July 2010, and brought it on stream in October after a commissioning period, creating Japan's first bottomless oil refinery.

The newly constructed plant refines heavy oil into gasoline, propylene, and aromatics. TOYO undertook the construction of propylene refining systems, gasoline desulfurization, and indirect alkylation as well as a wastewater treatment system. TOYO had to cope with installing heavy equipment in the constrained space at the site. Guided by a plan to meet the needs of the client and other collaborating companies, TOYO met the space requirements and brought the project in ahead of schedule. In addition, TOYO achieved a safety record of 2.44 million man-hours without a lost time incident.

TOYO Completes Active Pharmaceutical Ingredient Plant Expansion Project

In December 2010, TOYO completed an Active Pharmaceutical Ingredient (API) plant expansion project for DNP Fine Chemicals Fukushima Co., Ltd.

For this project, we managed to effectively utilize the unallocated part of the existing production facilities to construct a multiple production API plant that could produce high-value added products while also continuing to produce existing products.

The order was received in March 2010. Following basic design, TOYO completed the plant expansion in the short period of nine months. It was carried out safely, without accident, and without stopping existing production lines. The project involved detailed engineering, partial procurement of equipment, construction, and validation support.

Constructing an API plant utilizing the existing production facilities and equipment requires a different approach than constructing a new plant. For example, we create a load simulation of how the new production facilities will operate within the structure of the old facilities. TOYO provides the client with an optimal solution from an overall point of view. TOYO considers the continued effective use of existing facilities in applying for a building permit. TOYO also resolves issues related to standard requirements for achieving good manufacturing practice certification for setting up a multi-production line.

Completed API plant expansion

TOYO Receives Order for Large-Scale Thermal Hydraulics Test Facility SIRIUS-T

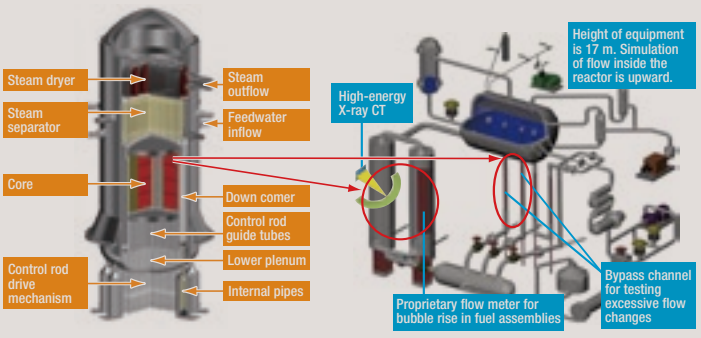
Japan's Central Research Institute of Electric Power Industry (CRIEPI) extensively researches testing systems for heat transfer, flow, and the special characteristics of cores in nuclear reactors. This research is conducted to develop precise reactor testing methods and wide-ranging systematic empirical validation of reactor performance. It is conducted in response to the need for the creation of reactor core management technology that can flexibly deal with increases in power output, existing power density, and use of different fuels for the purpose of boosting the safety and efficiency of light water reactors.

As part of its research efforts on heat transfer and flow in reactors, CRIEPI has designed a new large-scale thermal hydraulics test facility (SIRIUS-T). In December 2010, it signed a construction project contract with TOYO to construct the test facility.

The new facility is required to perform varied and repeated transient testing under the same temperature and pressure conditions as an actual reactor. A range of innovative measurement technology is being used to meet these requirements.

TOYO plans to complete construction of this cutting-edge testing facility in about two years.

Termed a "nuclear power renaissance," there is a worldwide movement toward constructing more nuclear power stations. In Japan, the public and private sectors continue to work together on various research projects to support a technological base for light water reactors and fast breeder reactors. TOYO is also playing a role in supporting this research.



ABWR vessel diagram　　SIRIUS-T diagram

Source: CRIEPI Forum 2010

ABWR: Advanced boiling water nuclear reactor

IN ACTION

Reliable Services in Upstream Engineering and EPC

KOREA

Since its establishment in 1987, Toyo-Korea has focused on strategic business domains, such as upstream engineering or basic design and Front End Engineering Design (FEED) works as well as traditional Engineering, Procurement, and Construction (EPC) services.

Major Projects

Project	Client	Location	Service	Status
ROPP Project	PT Pertamina	Indonesia	EPCm	MC achieved Jul. 2010
EB Project	Sibur-Khimprom CJSC	Russia	EPCm	Completed Nov. 2010
CABDE Project	PT Chandra Asri	Indonesia	E (FEED)	Completed Dec. 2010
IPS-II Project	BASF-YPC Company Limited	China	EPsCm	In progress
Yanchang PE Project	Yanchang Petroleum Group	China	E (FEED)	In progress
Pucheng PE Project	Pucheng Clean Energy Chemical Co. Ltd.	China	E (FEED)	In progress
NCC Revamping Project	Samsung Total Petrochemicals Co., Ltd.	Korea	E	In progress
LG BR Expansion Project	LG Chem., Ltd.	Korea	E	In progress
YDR-S BR Extension Project	Korea Kumho Petrochemical Co., Ltd.	Korea	EPs	In progress
BTX Revamping Project	Samsung Total Petrochemicals Co., Ltd.	Korea	E	In progress

E: Engineering P: Procurement Cm: Construction management Ps: Procurement service MC: Mechanical Completion

EB plant in Russia

Completion ceremony

In 2010, Toyo-Korea successfully completed two major overseas projects both in Indonesia and Russia on schedule. We expect that these countries will be important for traditional EPC projects which utilize the experience and know-how we have gained in previous projects there.

Toyo-Korea is also striving to develop business in Russia on petrochemical and power generation fields in close collaboration with Mitsui & Co., Ltd. We believe that Toyo-Korea's experience and knowledge in this country will make a contribution.

TOYO and LG Group have set up a new joint venture to globally develop green business. The new company, named LG-Toyo Engineering Co., Ltd., was established in October 2010 between Toyo-Korea and SERVEONE CO. LTD., an exclusive subsidiary of LG Group in Korea. The initial capital investment was shared by Toyo-Korea (30%) and SERVEONE (70%). This joint venture is expected to contribute to expanding our business field to ecologically friendly business.

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