"Project Formulation Survey" under the Governmental Commission on the Projects for ODA Overseas Economic Cooperation in FY2013

Summary Report

Democratic Socialist Republic of Sri Lanka

Study on Introduction and Dissemination of Pre-stressed Concrete Tank for Water Supply and Sewage Treatment System

March, 2014

Abe Nikko Kogyo Co. Ltd.
Kaihatsu Management Consulting Inc.
Joint Venture

The content of this report is a summary of the project formulation survey, which was commissioned by the Ministry of Foreign Affairs of Japan in the FY 2013 and is carried out by the consortium, Abe Nikko Kogyo Co. Ltd. and Kaihatsu Management Consulting Inc.. It does not represent the official view of the Ministry of Foreign Affairs.

Summary

Introduction

A study was conducted with the objectives of introducing pre-stressed concrete tank (PC tank) of Abe Nikko Kogyo Co. (referred to as “ABE” hereafter) for water supply systems in Sri Lanka and formulating a business plan for ABE to commence and expand an operation in the country by constructing PC tanks in water supply projects of Japanese ODA projects and others. The study especially focused on gathering and verifying basic information necessary for formulation of a business plan.

The period of the study was over five months from September 26, 2013 to February 28, 2014, including field survey in Sri Lanka for three months. The Study Team was a joint venture consists of ABE Kaihatsu Management Consulting Inc. (referred to as “KMC” hereafter) with eight members in total. The National Water Supply and Drainage Board of Sri Lanka (NWSDB), Embassy of Japan in Sri Lanka and JICA Sri Lanka Office cooperated in the study by providing necessary information. The Study Team obtained cooperation of Ceywater Consultants (Pvt.) Ltd., which undertook a part of the field survey. The Study Team also employed a supporting staff for socio-economic survey.

As a result of the study, it was found that ABE will be able to fulfil the needs of the country by introducing PC tanks, by reducing the cost and period of construction of water reservoirs as well as improving their durability. It was also found that the country has a future plan to construct several ground reservoirs, which are ideal to be constructed as PC tanks, and necessary material for construction of PC tanks are available in the country, and the technical level of local construction companies are satisfactory and the scheme of “pilot survey for disseminating SME’s technologies” of JICA is useful for implementation of a pilot project. Interest and understanding of ABE’s PC tanks among the staff of NWSDB and others were enhanced. The study was an important first step for ABE to implement a business plan in Sri Lanka in future. The followings are detail outcomes of the study.

I. Description of the current situation and development needs of the concerned development issues in Sri Lanka

Currently, 87.7 per cent of the population in Sri Lanka has access to safe drinking water and 43 per cent has piped water supply. The national policy of the country aims to increase the coverage of piped water supply to 60 per cent by 2010 and to provide safe drinking water to all the population. Cooperate strategy of NWSDB has a target to expand the coverage of piped water supply to 52.4 per cent of the population by 2016.

NWSDB plays the most important role in water supply system of the country. It is supposed to be the only organization in the country for Abe to supply PC tanks.

NWSDB conducts construction and rehabilitation of the large-scale water supply facility using foreign funds. Reduction of cost for construction of such facility is important for NWSDB as its burden for the repayment of loans and interests is becoming serious year by year. Introduction of ABE's PC tanks will contribute to reduce the above-mentioned financial burden, as the cost of the products is less than the conventional RC tanks.

NWSDB has a number of projects to construct new or expansion water treatment plants and ground reservoirs at the moment. Development of rural water supply facility is urgent in the country as it needs to improve hygiene and health conditions and convenience and rehabilitation of the conflict-affected area. The staff of NWSDB mentioned in the interviews that all the rural water supply projects are urgent and they expects ABE's PC tanks to reduce the period of construction

Most of the water tanks to be constructed in rural area are smaller-scaled ones. From the Japanese experience, there will be several advantaged if the capacity and shapes of these smaller-scale water tanks are standardized. If such standardization is realized, ABE will be able to introduce construction of PC tanks with pre-case concrete panels. It will reduce the period of construction drastically and will fulfil the above-mentioned urgent need of the reduction of the period of construction of rural water supply facility.

The Western Province has most of the large-scale construction projects. They are supposed to be constructed by reinforced concrete so far. This is because the NWSDB has not recognized features and advantages of PC tanks yet. ABE is going to support NWSDB to increase their awareness about the PC tanks by technical transfer and promotion activities, so that NWSDB would include construction of PC tanks in their plans.

The Study Team conducted a case study on repairs and maintenance of water tanks, and found that several large-scale circular RC tanks, which had not been used for a long time due to leakage, were repaired or reinforced. Several small-scale elevated water tanks were reinforced by PC materials, as they had leaked due to inappropriate design or construction. These examples show the needs in the country to improve skills on designing and construction of water tanks and also to improve their quality and durability by introducing ABE's PC technology.

II. Possible applicability of the ABE's PC tanks and PC technology, and prospects for future business development

ABE has developed PC tanks for water supply facility in 1957 and has constructed the first PC

tank in Japan. It is a pioneer of PC tanks. It has a 60 per cent of share of PC tanks in Japan at this moment. It has also involved in setting-up standards for designing and construction of PC tanks and made the PC tanks popular in the country. As a result, 70 per cent of the distribution tanks in the country are PC tanks.

Abe also has developed air-dome technology, which is very safe in construction, and construction method of PC tanks using pre-cast concrete panels, which reduces time for designing and construction. These are the superior technologies of ABE, which are not owned by other companies of similar kind in Japan and overseas.

As a result of the study, it was found that there are several companies which produce PC parts for railways, roads and bridges in Sri Lanka; however, there is no company which has an experience in constructing PC tanks. There are companies in India, China, Singapore and Malaysia, which have experience in construction of PC tanks. ABE was informed that they have experience in construction of PC tanks in conventional method; however, not with air-dome technology and pre-case concrete panels. It will be important to apply these technologies in overseas in future to differentiate ABE's technology with others.

There has been a drastic reduction in number of construction of new water reservoirs. It is an urgent task for ABE to expand its market and re-activate its business. ABE is expecting to realize succession of technology to the younger engineers, expand and stabilize its business by transferring its technology of development and dissemination of PC tanks to Sri Lanka.

ABE also plans to share information and lessons learned from the experience of business development in abroad to support similar effort of other companies in Chubu-region. The study team held a seminar on December 25, 2014 with participation of stakeholders in Chubu-region.

With regard to the future business plan, ABE is going to construct a PC tank in Sri Lanka under the scheme of "pilot survey for disseminating SME's technologies" of JICA in 2014, with objectives of contributing to improve water supply capacity in a rural area of the country, and creating a necessary technical and business environment for full-scale introduction and dissemination of PC tanks in the country. The next step is to bid for international competitive bidding for the projects of construction of larger-scale water tanks in the country to introduce PC tanks in 2016. It will be conducted by forming a joint-venture with foreign and domestic companies or undertaking the contract as a sub-contractor. Importance of sewerage treatment facility and urban transport facility, such as expressways and mono-rails, will be more important in the country in future in accordance with the economic development. ABE is going to expand its business in such area from 2018 onwards.

In order to learn about the potential local partners of ABE, which will be crucial for the future business, the Study Team visited five leading construction companies in the country in order to

find potential local partners of ABE. It was found that all of them do not have any problem in business policies and technical levels and had shown willingness to work as partners of ABE as sub-contractors or in joint ventures.

The study team identified several future tasks in technological matters, such as the need of preparation of standards of designing and construction of PC tanks and support for NWSDB staff to be able to design PC tanks in tender document in proper manner. Future tank in marketing of PC tanks is to make NWSDB understood the features and advantages of PC tanks so that they will decide to include PC tanks strategically in their future plans. To realize these matters, it is firstly needed for NWSDB to mention PC tanks in the Employer's Requirement in tender documents and to include PC tanks in project planning in future.

Ⅲ. Verification of adaptability of the ABE's PC tanks and PC technologies to Sri Lanka

There is a PC tank in Galle district. There are also two in Colombo district, one of which is under construction. However, most of the stakeholders, including the staff of NWSDB, are not aware about existence of PC tanks in the country. PC tanks are not popular too.

Unavailability of proper technology for designing and construction of PC tanks is one of the reasons that PC tanks have not been popular in the country. The other reason is that comparative advantage of PC tanks over conventional RC tanks has not been shown clearly. It is a problem to define design concept of RC tanks at the time of comparison, as it has not been standardized yet in the country.

The Study Team inspected the PC tank in Colombo district, which was under construction, and found that the finishing work such as the treatment after hardening of concrete and placement of PC wires were not appropriate. Several problems occurred during the tensioning work of PC wires; however, the Chinese contractor of the tank could not deal with it properly. This shows, as mentioned earlier, absence of proper technology on designing and construction of PC tanks is one of the reasons that PC tanks had not become popular, although several PC tanks had been constructed in the past.

The Study Team studied the needs in the country in improvement of durability of water tanks, reduction of period and cost of construction of water tanks and found that:

- The existing water tanks in the country have certain durability. Leakages of underground water tank cannot be seen. Information about work items and cost of repairs of water tanks has not been analyzed by NWSDB. Therefore, NWSDB does not consider improvement of durability of water tanks and reduction of cost of repairs

and maintenance as an urgent need. However, the Study Team considers improvement of quality and durability of water tanks is still necessary as the Team has observed that several water tanks do not have durability as they were constructed inappropriately and observed that several water tanks, which were not used for a long time due to leakages, were repaired or reinforced, sometimes with PC materials.

- Expansion of rural water supply has become a more urgent issue recently in the country, as pollution of underground water by agriculture chemicals became serious in some rural areas. Recently, high incidence of kidney diseases was observed in a rural area. Therefore, there is a strong need for reduction of period of construction of rural water supply facility. Some senior staff members of NWSDB mentioned that they would appreciate it if the period of construction of PC tanks is shorter than RC tank, even if the costs of these two types of water tanks are almost the same. The Study Team is confident that ABE will be able to fulfil this strong need in time reduction for construction by introducing air-dome technology and construction methodology using pre-cast concrete panels in future.
- NWSDB utilizes foreign fund for new construction and expansion of water supply systems. The cost of loan and interests is a serious financial burden for the organization and therefore, minimizing cost of construction of water supply facility is a priority.

The Study Team conducted a detail study on comparison of construction cost of circular RC tanks and PC tanks in different capacities. As a result, it was found that PC tanks of any capacities, including medium-scale PC tanks of 2,000m^3, have comparative advantage in construction cost.

The Study Team also found that necessary materials for construction of PC tanks, including PC wires, are available in Sri Lanka and are not needed to be imported from Japan. Quality of the PC materials available in the country meet the technical British Standard Codes, which are used in the country, and even cheaper than those used in Japan.

The Study Team conducted a kick-off meeting and a final seminar with participation of staff of NWSDB and others. As a result, understanding of features and advantages of PC tanks, interest in ABE's technology, such as air-dome technology and construction method using pre-case PC concrete panels, were promoted. This was a valuable first step for ABE to commence a business in the country. It is especially appreciated that a senior manager of NWSDB mentioned the necessity about mentioning a sentence in Employer's Requirements in Request of Proposals to accept proposal of PC tanks, and promote tenders with design-built

contract, in order to create a suitable environment for ABE to promote PC tanks in the country.

IV. Expected development impact and effect on business development of ABE in Sri Lanka through proposed ODA projects

The pilot project to be implemented under the scheme of "pilot survey for disseminating SME's technologies" of JICA, which is described in the Chapter Five of this report, will greatly contribute improving capacity of water supply in Beruwala.

As mentioned above, there is an urgent need in reduction of cost and period of construction of water supply facilities as well as improvement of durability. The cost of NWSDB in construction projects will be reduced; and therefore, contribute to reduction in financial cost, when ABE would supply numbers of PC tanks in future. Application of ABE's technology, such as air-dome technology and usage of pre-case concrete panels for construction, will reduce the period of construction for water reservoirs; therefore contribute to early completion of urgent projects and ultimately realize timely achievement of targeted coverage of the water supply system in the country. In this way, introduction of PC tanks complies with the development policy and needs of the country.

V. Proposals for formulating ODA projects

The Study Team plans ABE's participation in ODA projects in future as follows:

(1) Pilot survey for disseminating SME's technologies

The next step for ABE to promote PC tanks is to convince senior management of NWSDB on the comparative advantages of PC tanks and ABE's technology in designing and construction of PC tanks. For that, it is needed for ABE to construct a PC tank in the country as a pilot project under the scheme of "pilot survey for disseminating SME's technologies" of JICA. In addition to constructing a PC tank, ABE is going to transfer technology of planning, designing and construction of PC tanks to the stakeholders of Sri Lanka to create a suitable environment for expanding a business in future.

The Study Team has discussed with NWSDB to construct a PC tank of capacity of 2,000m^3as a pilot project in Beruwala city in Kalutala district of Western province, which was selected as the first priority location. NWSDB has issued a letter to express its interest to the pilot project. NWSDB's willingness to cooperate with ABE in formulation of the project and to bear the

responsibility and cost of land acquisition, land clearance and construction of additional facility were also mentioned in the letter.

(2) Bidding for projects of construction of larger-scale water tanks and possibility of cooperating in ODA loan and grant projects of JICA

ABE is going to bid for projects of construction of larger-scale water tanks after completion of the pilot project under the scheme of “pilot survey for disseminating SME’s technologies” of JICA. NWSDB has the plans to construct five large-scale water tanks with capacity of more than 3,000m^3 in Western province. Detail design and selection of contractors were still not conducted for these water tanks and therefore, there is a room for ABE to undertake the construction.

JICA is the top donor next to ADB in the water supply sector in Sri Lanka at this moment. The number of projects supported by JICA is much more than that of others. Therefore, there is a possibility for the above-mentioned construction of larger-scale water tanks to be implemented under the ODA loan or grant schemes of JICA if this trend will continue in future, too. It was found in this study that a PC tank is being constructed by a Chinese contractor under the ODA loan project has several technical issues to overcome. ABE is willing to contribute to ensure quality of the water tanks to be constructed under the scheme of ODA loan or grant by participating in the same as a part of its business in the country.

Project Formulation Survey

■ Sri Lanka, Study on Introduction and Dissemination of Pre-stressed Concrete Tank for Water Supply and Sewage Treatment System

SMEs and Counterpart Organization

- Name of SME: Abe Nikko Kogyo Co. Ltd.
- Location of SME: Gifu Pref., Japan
- Survey Site : Western Province, Sri Lanka
- Counterpart Organization: National Water Supply and Drainage Board (NWSDB), Sri Lanka

Concerned Development Issues

- Need to speed up expansion of water supply facility because of waterborne diseases and shortage of ground water especially in rural areas.
- Limited land space for water tank in urban areas.
- Need to reduce cost of construction to keep the financial status of NWSDB sound.
- The country has some technical issues:
  - to construct round shape water tanks.
  - designing and construction of PC tanks.

Products and Technologies of SMEs

ABE's pre-stressed concrete tank have advantages of:

- Less in construction cost,
- Shorter in construction period,
- Less land area required,
- Technically superior than existing PC tanks in the country and
- Durable and no maintenance needed

Will contribute to reduce time & cost for construction of water tanks and expedite water supply expansion.

Proposed ODA Projects and Expected Impact

- Construct a PC tank using the scheme of "Feasibility survey and Pilot Project for Disseminating under the Governmental Commission on the Project for ODA Overseas Economic Cooperation in FY2014"

<impact> Demonstration and technical transfer on designing and construction of ABE's PC tank.

Future Business Development of SMEs

- Undertake construction of large scale water tanks as a contractor/sub-contractor.
- Undertake construction of PC sewerage digestion tanks, PC bridges and highways.
- Expand business operation in water sector projects in surrounding countries.