

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

Summary Report

Thailand

“ODA Project Formulation Survey on
popularization of 3D maintenance method for
structures by Japan’s high-tech survey
instruments and measurement technologies”

March, 2014

Kansai Construction Survey/Oriental Consultants

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 (Kansai Construction Survey/ Oriental Consultants Joint Venture). It does not represent the official view of the Ministry of Foreign Affairs.

Introduction

I. Description of the current situation and development needs of the concerned

Thailand is one of the progressive countries for economic development among Asian countries and has an important role for more improvement economically and politically in Asian region including Japan.

Construction of roads and bridges has been mainly started in the 1980s in Thailand, however, budgetary allocation for maintenance work is still limited compared with development works due to the lack of basic infrastructure in Thailand and the emphasis on budgetary allocation to development works. There are concerns and interests for maintenance works for existing bridges which number is increasing yearly, but sufficient countermeasures have not been taken yet because of lack of budget and “breakdown maintenance” which covers only surfaced serious damages for repair is now the mainstream in Thailand.

In order not to repeat the same mistake as developed countries, it is important to predict deterioration based on accurate inspection data and to introduce “preventive maintenance”, which can prevent accident or damage caused by aging, from the early stage of structure's life-time. Japanese ODA has greatly contributed to development of Thailand's infrastructure so far. It is very important for Japan to contribute to improvement of maintenance technology in developing countries using the vast experiences Japan has.

II. Possible applicability of the SME's products and technologies, and prospects for future business development

The proposed technology for this study is a remote crack inspection system, “KUMONOS”, which was developed by Kansai Construction Survey (KCS). KUMONOS can measure cracks, which is the most important inspection for maintenance work, from remote place with a high degree of accuracy and can make drawings automatically. Also, 3D Laser Scanner will be applicable to obtain accurate drawings which will be used for maintenance works. 3D Laser Scanner can obtain huge number of point cloud data of structure and convert them into coordinate data. Use of KUMONOS and 3D Laser Scanner will be applicable for this project.

Continuous use of KUMONOS and 3D Laser Scanner, which can obtain states of structure such as shape and cracks as quantitative data accurately, enables to obtain information on not only existing condition of structure but also the change over time, such as deformation and aging.

And identification of abnormal location and deterioration prediction can be achieved as a result. Furthermore, immeasurable locations of structure can be measured by KUMONOS from remote place and it will lead to minimization of risk of missing serious defect.

In overseas business development, the main task is selling of KUMONOS with technical transfer and applied use of 3D Laser Scanner. The business includes transfer of know-how suitable to each country or organization and building a system for sustainable use of KUMONOS.

In Thailand, ensuring and training technical staff who is in charge of measurement by KUMONOS and 3D Laser Scanner are is expected to be carried out in cooperation with local partners as well as selling business of the equipment. It is expected to dispatch the Thai engineers to other countries for conducting measurement work by KUMONOS in the future.

III. Verification of adaptability of the SME's products and technologies to the surveyed country (Demonstration and pilot survey)

Demonstration measurement for KUMONOS and 3D Laser Scanner was carried out for DRR, MRTA and DOH in addition to a presentation and a hearing survey in order to study possibility of adaptation of the proposed product and technology. In the presentation, effectiveness of introducing preventive maintenance was presented as well as that of the proposed product and technology, and importance of shift from breakdown maintenance was acknowledged. In the demonstration measurement, effectiveness of the application for measuring cracks at immeasurable locations of structure, which was pointed out as an issue in the meeting, was proved. Concrete image for the application was shared and the effectiveness was proved because an actual structure which was controlled by each agency was analyzed based on result of demonstration measurement. And it was also confirmed that the possibility of the application in Thailand was high because there was no special cause, which influenced the schedule of measurement, and there was less possibility of increase of man-hour compared with that in Japan.

IV. Expected development impact and effect on business development of the proposing SME in the surveyed country through proposed ODA projects

Awareness for aging or deterioration of existing bridges is quite low even though there are many

problems in maintenance field in Thailand. Present maintenance system is not sufficient because of shortage of budget, therefore, it is a problem that only possible and realistic works are selected and carried out now within limited budget. And it is also a big problem in Thailand that breakdown maintenance which was one of causes of accident and budget problem in developed countries is being done now.

In the recent years, improvement of awareness in maintenance field has been being achieved in Thailand gradually and DOH is now improving “Bridge Maintenance Management System (BMMS)” in order to use it for making a proper evidence for budgeting. There is a DOH’s plan to develop a bridge database including initial data and results of inspection, etc. during coming several years, however, it is difficult to make a repair plan based on a future deterioration prediction because only serious damages are observed and recorded by sketching and taking photos now in Thailand.

On the other hand, it shall be possible to use the DOH’s BMMS not only for making evidence for budgeting but also for carrying out preventive maintenance if a system which enables to determine suitable method and timing of repair work is developed based on checking the present states and the change over time by using accurate inspection data. Therefore, developing an initial database by using KUMONOS and 3D Laser Scanner, which has merits of “Increase of accuracy of inspection”, “Data collection for time-course analysis”, and “Creation of drawings which show shape of an object accurately”, shall contribute to solving a development issue Thailand has, which is a shift to preventive maintenance.

A variety of development effects can be obtained through application and utilization of KUMONOS and 3D Laser Scanner in Thailand within future ODA scheme. Effect by “Application” is to make possible prediction of deterioration of bridges and judgment of proper timing for repair and the method to do it. Effect by “Utilization” is to enhance maintenance ability for not only bridge also other infrastructures in Thailand. Effect by “Dissemination” is to increase safety of existing bridges by extending service life.

Application and utilization of KUMONOS and 3D Laser Scanner in the field of structure maintenance in Thailand by demonstrating their benefit to related agencies through ODA project will contribute to enhancement of maintenance ability in Thailand. Also, it can be an important step for KCS to develop their business as well because financial problem and lack of connection with local government can be solved at once. And it is also expected to increase demand for sale and measurement and to expand coverage of utilization in both Thailand and other countries after demonstrating adaptation and effectiveness of KUMONOS and 3D Laser Scanner in ODA project.

V. Proposals for formulating ODA projects

The following 2 plans, which will contribute to enhancement of structure maintenance in Thailand by using KUMONOS and 3D Laser Scanner, are recommended for ODA project;

- (1) Pilot survey for disseminating SME's technologies for popularization of 3D maintenance method for structures by Japan's high-tech survey instruments and measurement technologies

[Project purpose]

- To substantiate possibility of application and effectiveness of proposed products in bridge maintenance field in Thailand through a pilot measurement,
- To pave the way for sustainable use of the products by transferring know-how and technologies, and
- To raise the awareness of the importance of preventive maintenance by conducting educational campaign.

[Counterpart in Thailand] DOH, Bureau of Bridge Construction

[Total project cost(roughly estimated)] 100 million Yen (for 1 year)

[Activities]

The following 2 options are assumed and final decision will be made after discussion with the counterpart;

- 1) Option-1: Using both "KUMONOS" and "3D Laser Scanner"

- Measurement of cracks on bridge structure using KUMONOS and data management (pilot survey)
- Obtaining point cloud data for shape, location, size of structure using 3D Laser Scanner and creation of drawings (pilot survey)
- Educational campaign on importance of accurate deterioration prediction and roles of KUMONOS and 3D Laser Scanner in the field of bridge maintenance

- 2) Option-2: Using "KUMONOS" only

- Measurement of cracks on bridge structure using KUMONOS and data management (pilot survey)
- Educational campaign on the importance of accurate deterioration prediction and roles of KUMONOS and 3D Laser Scanner in the field of bridge maintenance

(2) Technical Cooperation Projects for strengthening bridge maintenance and management capacity

【Project Purpose】

Project purpose is to establish a foundation for future Japanese technical cooperation, which shall contribute to capacity building in asset management in Thailand, by accomplishing following purposes in the project;

- To strengthen bridge maintenance and management capability of DOH which maintains the National Road and Motorway,
- To conduct educational campaign on preventive bridge maintenance for relevant agencies in Thailand, and
- To develop effective and user friendly bridge maintenance system in order to contribute to improvement of condition of bridge maintenance in Thailand.

【Overall Goal】

- Service life of the existing bridges which are under DOH's control is extended and safety of the bridges is increased by conducting preventive maintenance.
- DOH's results to be spread to other maintenance organizations laterally and awareness for maintenance and improvement of bridge maintenance condition are raised.

【Project Purpose】

- Capability development for DOH's bridge maintenance work is done and the bridge maintenance capability is improved.
- System for lateral spread of DOH's results to other maintenance organizations is developed.

【Counterpart in Thailand】 DOH, Bureau of Bridge Construction

【Cooperation period】 3 years

Attachment: Outline of the survey

Project Formulation Survey Thailand, ODA Project Formulation Survey on popularization of 3D maintenance method for structures by Japan's high-tech survey instruments and measurement technologies

SMEs and Counterpart Organization

- Name of SME : Kansai Construction Survey Co., Ltd.
- Location of SME : Minoo-shi, Osaka-fu, Japan
- Survey Site : Counterpart Organization : Thailand (Bangkok), Department of Highways (DOH)

Concerned Development Issues

Establishment of implementation system for preventive maintenance of structures

- Raising of awareness about importance of maintenance
- Building an initial database that is essential for maintenance
- Introducing an inspection method which is accurate and doesn't rely on one's experience

A system of sustainable use will be constructed not only by accurate grasp of the present states but also by collecting data which can be used for deterioration prediction and development of future repair plan.

Products and Technologies of SMEs

Building an initial database using remote crack inspection system, "KUMONOS" and 3D Laser Scanner

- Present states (shape, deterioration condition like cracks) can be obtained accurately and quantitatively as digital data and change over time can be grasped.
- Risk of missing serious defect can be reduced because inaccessible places will be measured.

Accuracy of deterioration analysis will be improved and suitable timing and method for repair work will be selected.

Proposed ODA Projects and Expected Impact

- To substantiate possibility of application and effectiveness of the proposed technologies in bridge maintenance field in Thailand and to pave the way for a sustainable use of the technologies by transferring know-how through Pilot survey for disseminating SME's technologies (pilot measurement). And to raise awareness of importance of preventive maintenance by conducting educational campaign.
- To strengthen bridge maintenance and management capability and to conduct educational campaign on preventive bridge maintenance for concerned agencies in Thailand through Technical Cooperation Projects. And to develop effective and user friendly bridge maintenance system in order to contribute to improvement of bridge maintenance condition in Thailand.

Future Business Development of SMEs

- Ensuring and training technical staff who can use KUMONOS and 3D Laser Scanner will be done in cooperation with local partners as well as selling business of the equipment in Thailand. The Thai engineers will be dispatched to the other countries to conduct measurement work in the future.

