

英文要約

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

Summary Report

Republic of India

Project Formulation Survey of services for water
leakage detection

March, 2014

Joint Venture of Suido Technical Service Co. Ltd., and
MRI Research Associates Inc.

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 (Joint Venture of Suido Technical Service Co. Ltd., and MRI Research Associates Inc.). It does not represent the official view of the Ministry of Foreign Affairs.

Introduction

This survey was implemented to contribute to providing a solution to the Indian water service sector by technology transfer and dissemination of water leakage detection service provided by Suido Technical Service Co. Ltd (STS). In order to meet the goal and meet the demands for improving water services quality in India, STS, conducted a study of current status of water leakage and detection methods in India, technical information to figure out effectiveness and competitiveness of the STS's technologies in Indian market, and proposed a possible project for the ODA project and a future private-sector business model.

I . Current situation and development needs of the concerned development issues in the surveyed country

The Indian Government institutes "Five Year Plan" to improve domestic water services and its Twelfth Five Year Plan (2012-2017) is on progress. As it stands in 2011, approximately 75 million people living in cities still have no access to water services because of the expanding gap between demand and supply as a result of rapid urbanization and population growth. Even in areas where water is supplied, people have problems with quality, quantity of water received and hours of supply.

STS implemented the survey in Bangalore. With rapid industrial development, the population in metropolitan Bangalore reached 8.5 million in 2012 and more people keep coming into the city. Water supply services in Bangalore are provided by Bangalore Water Supply and Sewerage Board (BWSSB). Though BWSSB had capacity to supply 950 million of liters per day (MLD) in 2011, water demand for the number of people in city at that time (9 million people) was 1,800MLD (calculated by 200 liters per person a day) and 850MLD was short.

Projects and pilot tests to decrease water leakage are operated in various cities in India. Each case has made progress on some level but keeps having problems on maturity of water leakage detection technologies. Therefore, there are compelling needs for development of the detection technologies and implementation of those technologies in all over India.

To detect underground water leakage, several technologies are already applied in India. For example, the acoustic listening method by using the listening sticks was already tried out from 1990 in a project supported by World Bank. However water leakage detection methods are not commonly practiced in the daily operation of the

water operations in India. In case of Bangalore, underground water leakage detection is not conducted in the daily work. Repair work is limited only to leakages which could detect on ground surface. Record shows 5 inspectors found 130 leaking points in one month by surface observation. Immediate implementation of both under/on the ground water leakage detection is required in Bangalore. From 2012, BWSSB has started the “Distribution Improvement and Unaccounted Flow of Water (UFW) Reduction Project”, funded by Japanese ODA Loan. The project covers 3 out of 6 water supply divisions in Bangalore and contracted to three private companies. The project is in the beginning phase but the low pressure of the water pipe in Bangalore makes the water leakage detection difficult.

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

STS's core technology, designed to improve water leakage detection efficiency, is the continuous monitoring investigation method using “L-Sign”. Built-in highly sensitive vibration sensor in L-sign works well when it is installed in suitable planar location to detect leakage correctly and continuously.

The needs survey conducted by Mitsubishi Research Institute in the FY 2012 indicated that it is possible to apply STS's know-how and detection technology, and it is the background of the proposal of this project. Following this suggestion, STS decided to implement the investigation in order to explore future opportunity to expand their business to prospective overseas market. Since STS is a member of Yokohama Water Business Conference that was launched by Yokohama city government in 2011, we can expect business expansion to India could make spinoff effects on technical transfer, personal training, technical development and any other business elements in cooperation with conference members which works on water services like maintenance of pipelines.

As a result of survey for BWSSB and other relevant companies associated with STS's business expansion to Indian market, following three business models were evaluated.

- (1) Introduction of water leak detection service for water management projects carried out under local institution/companies in developing countries.
- (2) Introduction of pipeline management service for BWSSB.
- (3) Introduction of water leak detection service in any other developing area/countries.

III. Verification of adaptability of the SME's products and technologies to the surveyed

country (Demonstration and pilot survey)

The equipment developed under Japanese conditions, should be tuned to Bangalore's conditions. In order to figure out necessary technical reform points and the best way for detection, pilot test was operated in advance.

One area of E1 Subdivision located in east Bangalore was selected for this pilot test. There were 8,000m distribution length of water pipes and 400 house connections. Feasibility tests for all available methods, L-Sign, Listing water leak detection, and Cross-Correlation investigation were conducted. Additionally, the possibility of introducing Gas Trace Investigation was confirmed by Walk Through. As a result, 8 leakages including 2 underground leakages were detected. Estimated water loss was 110 liters per minutes from 8 leakages in total. Feasibility of each method after this pilot test was listed below.

Acoustic listening method: Leakage could be detected even under low water pressure condition. Even though we assumed this method might cause some difficulty in picking up leak sounds near noisy urban roads, experienced inspector was able to detect leak sounds. Therefore, we conclude listening leak detection is capable of picking up leak sounds at joint of pipe under low water pressure condition.

L-Sign: Detection was successful both on distribution pipes and water service pipes. L-Sign also picked up the sound of water pouring into an individual sump tank. Therefore equipment program needs to be modified to stop detection while water is being poured into a sump tank. L-Sign was affected by the noise where there is continuous traffic noise, but this was not the case with residential areas. Sensitivity of L-Sign needs to be lowered depending on the area for detection in order to minimize errors associated with traffic noises.

Cross-Correlation method: If certain volume of air, as much as making loud gurgling sound, remains in pipes after water passing through, shape of sound wave was disturbed and noise interrupted leakage detection. When there is only a small amount of air in the pipe one or two hours after water started passing, shape of sound wave could get stabilized and detection became possible. So, cross-correlation method can be used if detection time is appropriately chosen.

Gas tracing method: To do this detection, sluice valve for gas injection is necessary. Pipeline in India has sluice valves at intervals of more than 400m and filling gas through such long length of pipes needs too much cost. Considering need of additional sluice valves on existing pipelines, this method is unfit for operation in India in the immediate future.

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

Under rapid expansion of urban areas, there is an urgent need to construct water service infrastructures in India. Not only the infrastructure but also water-resource development is a big issue. . Absolute water shortage and lack of construction technology are main factors contributing to those serious issues.

Introducing STS's sensor and technology to India could have direct effects to improve quality of water services in Bangalore which faces many serious issues such as preventing water leakage promptly and securing water resource. The result of pilot test (refer Chapter 3.) suggested detection and prevention of underground water leakage could save approximately 0.5 m³/hr of water per 1km of pipeline in Bangalore (Estimation = 0.852 m³/hour of leakage volume × 60.4% prevention ratio by leakage detection.) If the rate of leakage is reduced in the entire Bangalore, where BWSSB supplies water, we assume Bangalore would save water and achieve following economic effects in the future.

- Estimation of prevention for leakage in BWSSB's supply area = 48,611,430 m³/year
- Estimation of economic effects = 48,611,430 m³/year × Rs25
= Rs1,215,285,750 = US \$ 24,305,715

V. Proposals for formulating ODA projects

Based on ODA scheme, we made the proposal to transfer and introduce detection technologies and introduce continuous leak monitoring equipment to BWSSB. Four options were brought up as possible ODA schemes: 1) Pilot survey for disseminating SME's technologies, 2) Technical cooperation project associated with Japanese ODA Loan, 3) Business operation with Japanese ODA Loan, 4). Non-Project Grant Aid for Provision of Japanese SME's Products. We indicate the result of consideration and schedule of proposals in table and figure below.

Table Consideration result of ODA scheme

ODA scheme	Content	Consideration result
Pilot survey for disseminating SME's technologies	By signing MOU with BWSSB, STS implements the promotion and demonstration project of localization of the water leak detection system(L-Sign)	Forward : Project could be started next fiscal year.
Technical cooperation project associated with Japanese ODA Loan	Provide technical assistance in association with the Japanese ODA Loan project which is being implemented by BWSSB	Reasonable : Project could be started in 2-3 years.
Business operation with Japanese ODA Loan	Will implement new BWSSB project with Japanese ODA Loan.	Considerable : Operability deserves consideration in the long run, but needs time to formulate a project plan.
Non-Project Grant Aid for Provision of Japanese SME's Products	Registered L-Sign as procurement at BWSSB.	Negative : Low operability under current situation.

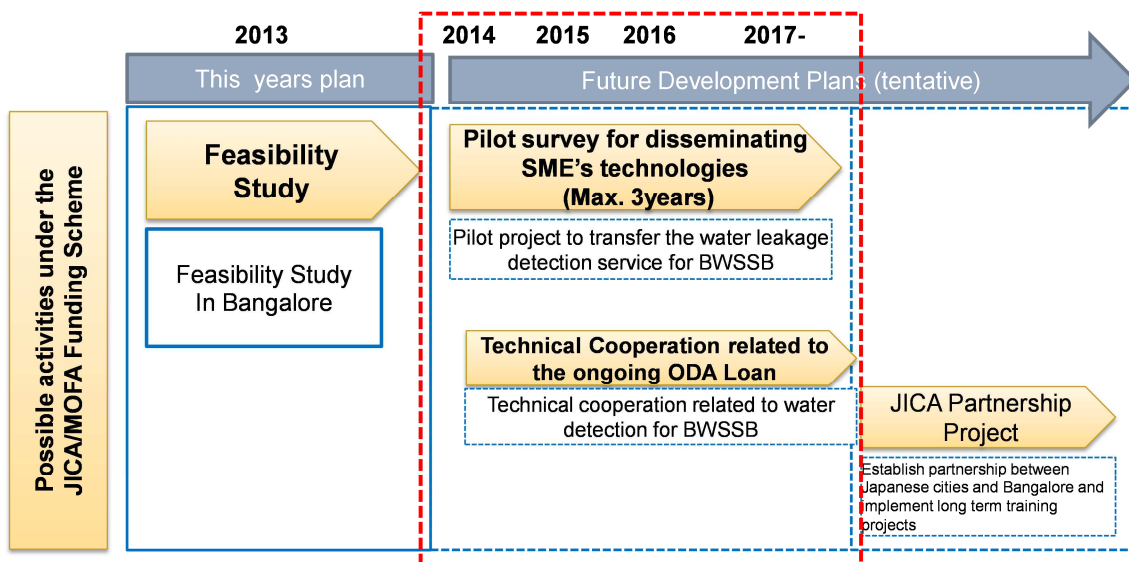


Figure Future Development Plan of ODA Scheme

Survey for water leakage detection in India

Feasibility Study of the Water Leakage Detection Service in India

SMEs and Counterpart Organization

- Name of SME : Suido Technical Service Co. Ltd
- Location of SME : Yokohama city, Kanagawa Pref.
- Survey Site · C/P : Bangalore city, India ,Bangalore Water Supply and Sewerage Board (BWSSB)

Concerned Development Issues

- Concerned issues on water network in India
- Leakage caused by aging water pipes
 - Management of water supply source and quality to meet demands of increased population
 - Improvement of customer services (24 hours clean water supply, etc.)
- Concerned issues in Bangalore
- Leakage caused by aging and distorted water pipes
 - Undeveloped leakage detection technique

Products and Technologies of SMEs

- Technologies and equipment for survey to monitor and rectify water leakage
- Cross-correlation method: find leakage point by sound signals
 - Gas trace detection method: detect leakage point by filling helium or non-inflammable hydrogen gas in a water pipe
 - Continuous monitoring investigation method: detect leakage using L-Sign (leak monitoring system)

Proposed ODA Projects and Expected Impact

- Possible ODA Schemes: Pilot survey for disseminating SME's technologies, Technical cooperation project associated with yen-loan, Technical cooperation with loan assistance.
- Improvement of water service quality in Bangalore through prompt detection/prevention of leakage and water supply management.
- Revenue increase by reducing illegal water usage, supply clear water to wider areas and for longer hours.

Future Business Development of SMEs

- Implementation and popularization of leak detection system in India.
- Provision of leak monitoring/detecting systems by promoting L-Sign specifically tuned for local condition.
- Dissemination of leak monitoring systems mainly using L-Sign in India.

