

Republic of Indonesia
Jakarta Provincial Government

Pilot Survey for
Disseminating SME's Technologies on
Pipe Jacking for Sewage Works

Summary Report

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Japan International Cooperation Agency (JICA)

Iseki Poly-Tech Inc.

Pilot Survey for Disseminating SME's Technologies on Pipe Jacking for Sewage Works

Summary Report

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1. BACKGROUND

The percentage of sewerage population is no more than 2% and the further sewerage development is urgently required in Jakarta. However, the serious traffic congestion prevents the smooth implementation of construction works of underground facilities by open cut method.

As a result of "Feasibility Survey for Introduction and Localization of Pipe Jacking Technologies for Sewage Works (2013)", the superiority of Japanese micro tunneling technology was confirmed and the dissemination of long-distance and curved micro tunneling method was expected because it can decrease the social cost during construction and can accelerate the sewerage development in Jakarta.

2. OUTLINE OF THE PILOT SURVEY FOR DISSEMINATING SME'S TECHNOLOGIES

(1) Objective:

Taking "Feasibility study in 2013" mentioned above into consideration, Iseki Poly-Tech, Inc aimed to proceed demonstration for micro tunneling project with long distance and curve jacking technology, PR and disseminating work, and explore business model in Indonesia market.

Through this Pilot Survey, it is expected that Indonesian counterpart would be able to acknowledge advantage of long distance and curve jacking technology, which could minimize traffic congestion while construction comparing with conventional jacking method. In addition, local contractor would be able to understand know-how for captioned technology, and the long distance and curve jacking technology would become popular method and be considered to apply to underground infrastructure project in Jakarta.

(2) Pilot Project of the Sewer Installation by Micro tunneling Method

1) Demonstration project by long distance slurry type micro tunneling method

Iseki Poly-tech Inc. (hereinafter referred to as "Iseki") provided their micro tunneling shield machine; "Unclemole-L (TCL-1000)" to the construction work of PD PAL Jaya which is the public corporation managing the sewage works in Jakarta. The pilot micro tunneling work by "Unclemole-L (TCL-1000)" with safe remote control system was conducted in the construction work of PD PAL Jaya to demonstrate the superiority of Japanese long-distance and curved micro tunneling method comparing with conventional short-distance and straight micro tunneling method. This was the first challenge to apply Japanese style of long distance jacking in Indonesia and also penetrate across under Sudirman street, which is one of the most important streets in Jakarta. Iseki micro tunneling was conducted without any disruption on this street so that traffic congestion was minimized.

In addition, Iseki dispatched the experienced engineer to this micro tunneling work to instruct the micro tunneling work to the contractor and to carry out capacity development activities through on-the-job training, which can contribute to establish the partnership with local companies and to expand the business opportunity in Indonesia.

2) PR and Dissemination Activities

The workshop on the pilot project and micro tunneling works was carried out for the key staffs of Ministry of Public Works, DKI Jakarta and another utility companies, and the local contractors and consultants. In addition, several PR activities were carried out during the construction period.

Furthermore, the training program in Japan was carried out for the local partners to study Japanese micro tunneling technologies and to develop their capacity.

3) Investigation for the Business Expansion

The material and machines for the micro tunneling works shall be imported due to the insufficient suppliers and contractors in Indonesia so far. However, the customs procedure requires certain period, which causes the inconvenience to the business. Therefore, for the future business expansion in Indonesia, the activities to find appropriate partner company was carried out to request the business of storing the spare parts and maintaining the micro tunneling shield machine.

In addition, the business circumstance and the capacity of partner companies were assessed to find out the clear strategy of the future business in Indonesia, which is to establish one stop business supply chain in Indonesia.

(3) Information of Product/ Technology Provided:

The micro tunneling method is the technology to install the underground tunnel without huge excavation. Thus, comparing the open cut method, it can decrease the negative impact to the traffics during construction.

Iseki produces variety of micro tunneling shield machines and its share is the best in the world. More than 2,000 machines have been applied in Japan and more than 500 machines all over the world.

Aforementioned “Unclemole-L (TCL-1000)” which was applied for the pilot project has the advantages that 1) it can be applicable for the wide range of soil conditions, 2) it can be applicable for the long-distance and curved micro tunneling works, and 3) it ensures the safe construction by the remote operation.

(4) Counterpart Organization:

The counterpart organizations of Indonesia are DKI Jakarta as a representative of local government and PD PAL Jaya as a responsible organization of sewage works in Jakarta.

(5) Target Area:

The target area of this pilot survey is JABODETABEK which is consist with the DKI Jakarta and its neighboring regions.

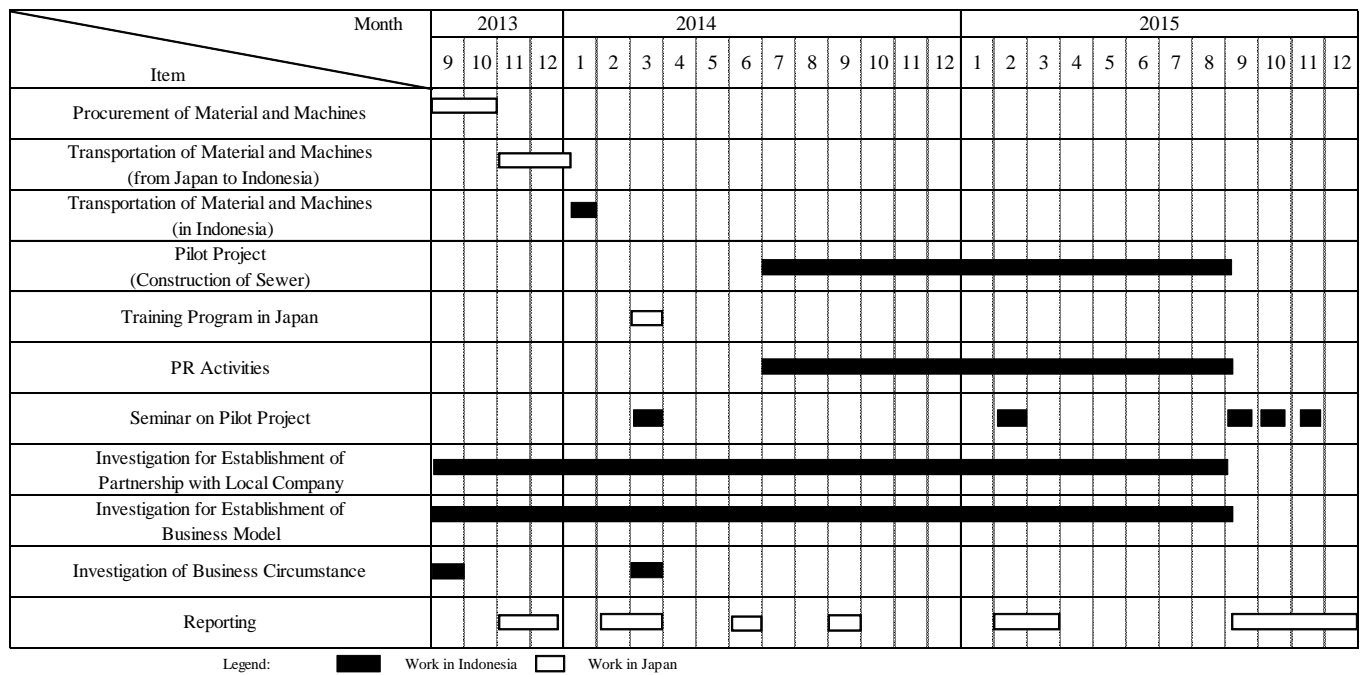
The project site of pilot project for the demonstration of Japanese micro tunneling technology is Sudirman Street in the center of Senayan.

(6) Beneficiaries:

Citizen and Company in Jakarta

(7) Project Schedule:

This pilot survey was conducted from September, 2013 to December, 2015. The project schedule is shown in Figure 2.1.



Source: Pilot Survey Team

Figure 2.1 Project Schedule

(8) Manning Schedule:

The manning schedule in this pilot survey is shown in Figure 2.2.

Position	Name	Company	2013				2014												2015																		
			9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12							
Team Leader	Akiyoshi MATSUZAKI	Iseki Poly-tech	■																																	■	
Maintenance of Microtunneling Shield	Yasuhiro MATSUMOTO	Iseki Poly-tech																																			
Construction Planning and Instruction	Katsuyuki SASAKI	Iseki Poly-tech				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Marketing Research	Tomoharu WAKITA	Iseki Poly-tech	■						■	■																										■	
Establishment of Company	Toshihiro NAKANISHI	Iseki Poly-tech																																		■	
Construction Planning	Toru SATO	Iseki Poly-tech																																			
Machinery	Makoto KAIJYAMA	Iseki Poly-tech																																			
Maintenance of Microtunneling Shield	Yukio ARAI	Iseki Poly-tech																																			
Chief Adviser	Yakuro INOUE	Nippon Koei	■		□				■													□	□	□													
Seminar Planning	Takamasa NISHIKAWA	Nippon Koei												□																					□		
Lecture in Seminar	Kazuhide ISHIKAWA	JMA																																			
C/S Inspection	Toshihiro Takeuchi	JMA																																			

Legend: ■ Work in Indonesia □ Work in Japan

Source: Pilot Survey Team

Figure 2.2 Manning Schedule

3. ACHIEVEMENT OF THE SURVEY

(1) Pilot Project of the Sewer Installation

1) Outline of the Construction Work

The outline of construction work is summarized as follows:

- Pipe diameter : 1,000mm
- Length of Construction : 300m
- Method : Long Distance Slurry Type Micro tunneling
- Contractor: PT KARTIKA EKAYASA
- The layout of construction work: Figure 3.1
- The typical pictures of pilot project: Figure 3.2

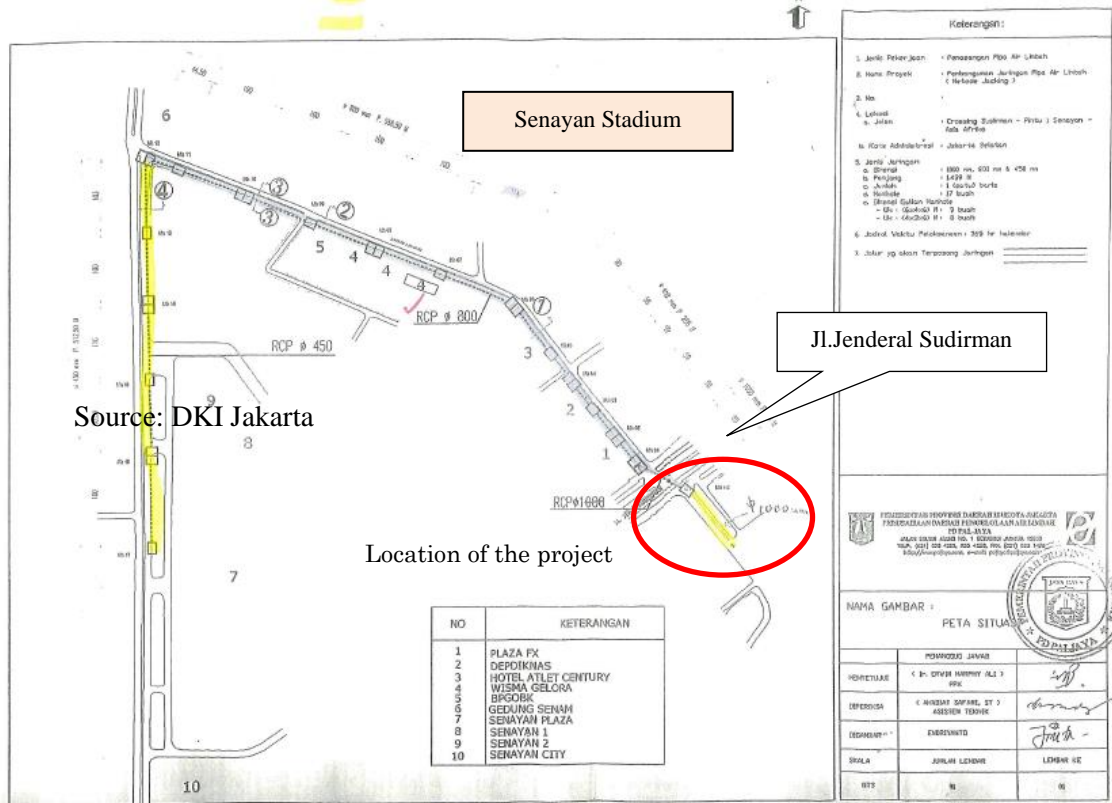


Figure 3.1 Layout of Pilot Project

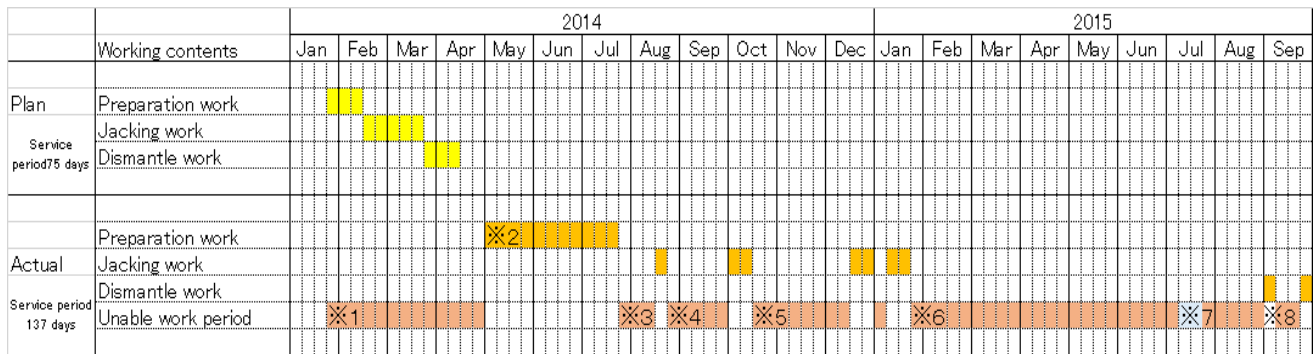
	
<p>Micro tunneling Shield Machine</p>	<p>Collapse of Drive Shaft</p>
	
<p>Ceremony for Starting</p>	<p>Micro tunneling Works</p>
	
<p>Training by Iseki instructor</p>	<p>Arrival of Micro tunneling Shield Machine</p>
	
<p>Micro tunneling Shield Machine after Construction</p>	<p>Success to connect to existing man hole</p>

Source: DKI Jakarta

Figure 3.2 Photos of Pilot Project

2) The Record of the Construction Work

The record of the construction work in pilot project is as shown in Figure 3.2.



Source: Pilot Survey Team

Note: *1: Collapse of drive shaft:

After the mobilization, the construction work delayed about three months due to the collapse of the drive shaft.

The reconstruction of drive shaft required certain period and it causes two months delay of the construction schedule.

*2: Re-selection of contractor of micro tunneling work and Ramadan:

The initial contractor of micro tunneling works were terminated and it took about two months to procure another contractor.

*3: Selection of contractor:

After the preparation of micro tunneling works, the Survey Team had to wait the mobilization of new contractor.

*4: Escaping the culvert for electric cable:

PLN (electric power company) instructed the team that there is a high-voltage power cable (culvert) at the planned route which was not detected previously by the PD PAL Jaya. PLN instructed the team to circumvent it for the construction of sewer pipe, which caused the further delay.

*5: Neglected concrete waste prevented the micro tunneling work:

At the 150m from the drive shaft, there were the neglected concrete piles. Eight piles were found by inspection pit and five piles were removed by micro tunneling shield machine.

*6: Waiting for the construction permission of arrival shaft

The team had to wait the construction permission of arrival shaft by SCBD . In May, arrival shaft was started and completed in July. Machine was jacked until arriving shaft and successfully lifted up to surface.

*7 Lebaran

12th July to 26th was holiday.

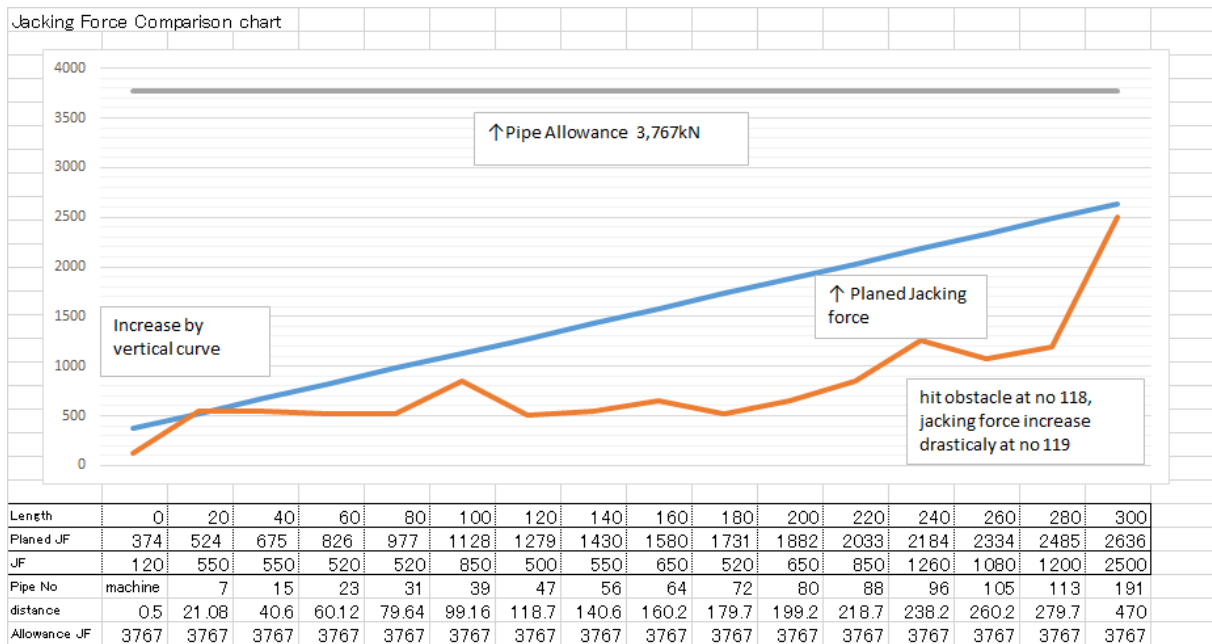
*8 Install steel pipe

In order to protect pipe line against MRT construction just under ϕ 1000mm pipe, ϕ 900 steel pipe was installed inside ϕ 1000mm pipe in related area which Tunnel Boring Machine will go through.

Figure 3.2 Record of Construction Work

3) Trend of Jacking Force during the Construction

The limit of micro tunneling distance is highly depend on the jacking force, thus the Japanese micro tunneling technology has been developed to decrease the jacking force during the construction. The comparison of the jacking force under conventional system and the Iseki's system; "Unclemole-L (TCL-1000)" is illustrated in Figure 3.3.



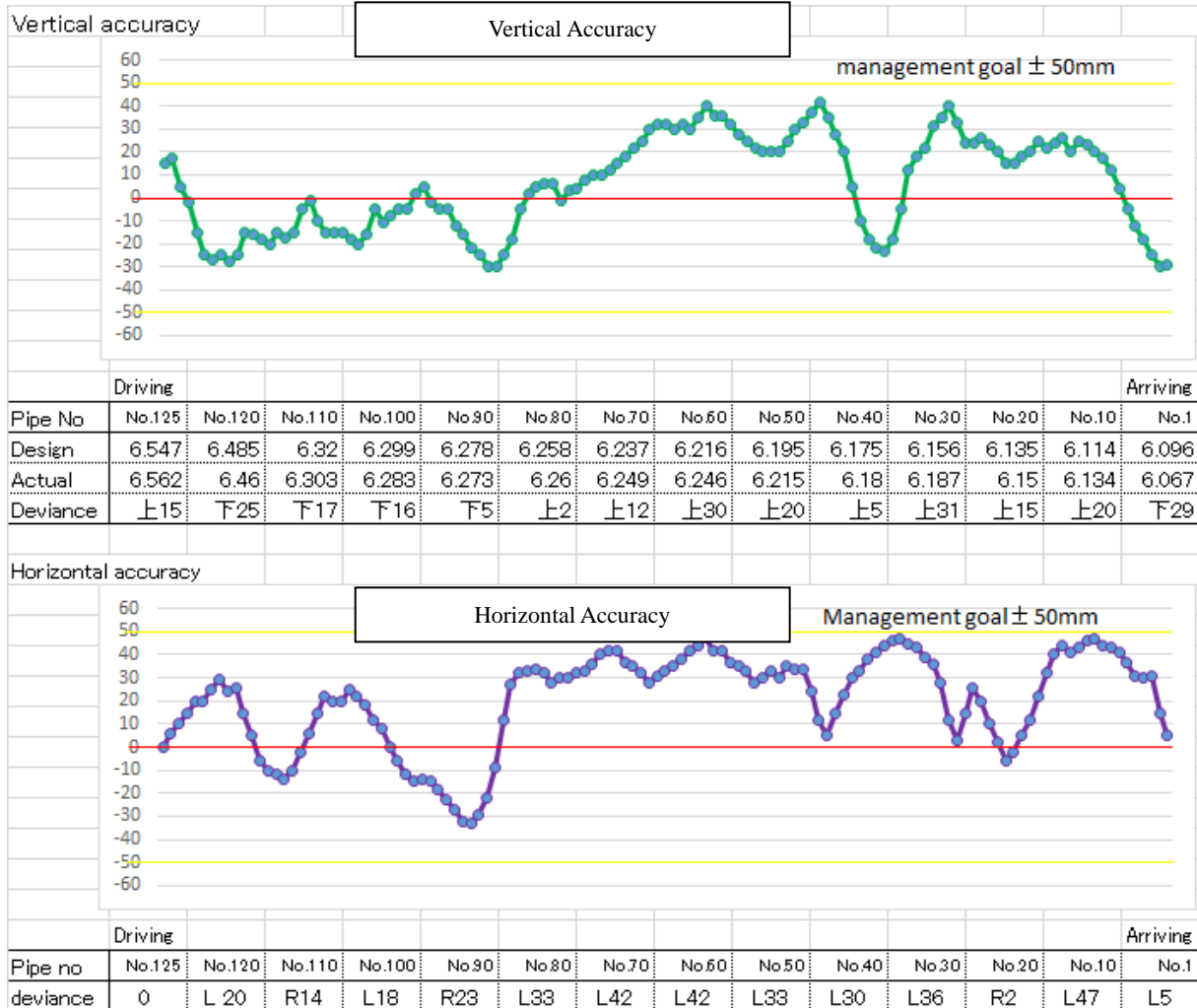
Source: Pilot Survey Team

Figure 3.3 Trend of Jacking Force

Iseki applied the system to lower the jacking force and the jacking force in the pilot project is about half of the conventional system as shown in Figure 3.3. As a result of this monitoring of jacking force during the pilot project, it was proved that the long distance jacking more than 300 m can be applicable by Iseki's system.

4) Accuracy of the Construction

As a result of monitoring, the vertical accuracy was within two centimeters and horizontal accuracy was within four centimeters, which shows the high-quality and accuracy of the construction work by the Iseki's system; "Unclemole-L (TCL-1000)".



Source: Pilot Survey Team

Figure 3.4 Accuracy of the Construction Work

5) Construction Supervision and Inspection

Iseki dispatched the skillful engineer to supervise the construction work and to inspect the operators and labors of local contractor.

(2) PR and Dissemination Activities

1) Training Program in Japan

The training program was carried out in Japan in March 2014 for the engineers of PT CARBEK NUSANTARA, which was the contractor of micro tunneling works in the pilot project, considering that the improvement of their skill of micro tunneling works was urgently required to accomplish the pilot project successfully.

The contents of the program was the site inspection of micro tunneling works in Japan and practical training of the maintenance of micro tunneling shield machine to understand its structure and to know the know-how of its maintenance at the factory related to Iseki.

2) Fourth Steering Committee Meeting for MPA

Between the Japanese and Indonesian governments, the fourth steering committee conference for “Jakarta Metropolitan Special Area and Investment Promotion (MPA)” was taken place in December 2013. At the conference, the progress of each project which is nominated in the “MPA master plan” was confirmed and the partnership for the further promotion of the project was agreed between Japan and Indonesian governments.

In the video picture to introduce the progress of the MPA’s subproject, the micro tunneling technology of Iseki was introduced as a part of the introduction of Jakarta sewerage project as shown in Figure 3.5.



Source: JICAchannel1 (<http://www.youtube.com/user/JICAchannel1>) 2014

Figure 3.5 Video Picture of the Steering Committee Meeting for MPA

3) Seminar for the Dissemination of Micro tunneling Method

Iseki Micro tunneling Seminar was held in Jakarta on March 4, 2014 with more than 50 attendees from Indonesian contractors and consultants, and Indonesian governmental agencies such as DKI Jakarta, CIPTA KARYA, PD PAL Jaya, and Dinas PU.

In this seminar, the cutting-edge micro tunneling technology was introduced by Prof. Matsui from Kyushu University, Japan. Furthermore, the sewerage plan in Jakarta was explained and the necessity of Japanese micro tunneling technology for the optimal implementation of the project was proposed. Hence, the seminar contributed to notify the Iseki's technologies and their necessity in the Indonesian market.

4) Signboard and Brochure

The signboard and brochure were prepared to notify the Japanese micro tunneling method as shown in Figure 3.6.



Source: Pilot Survey Team

Figure 3.6 Signboard of the Pilot Project

5) Introduction of Japanese Technology by Prime Minister's Office of Japan

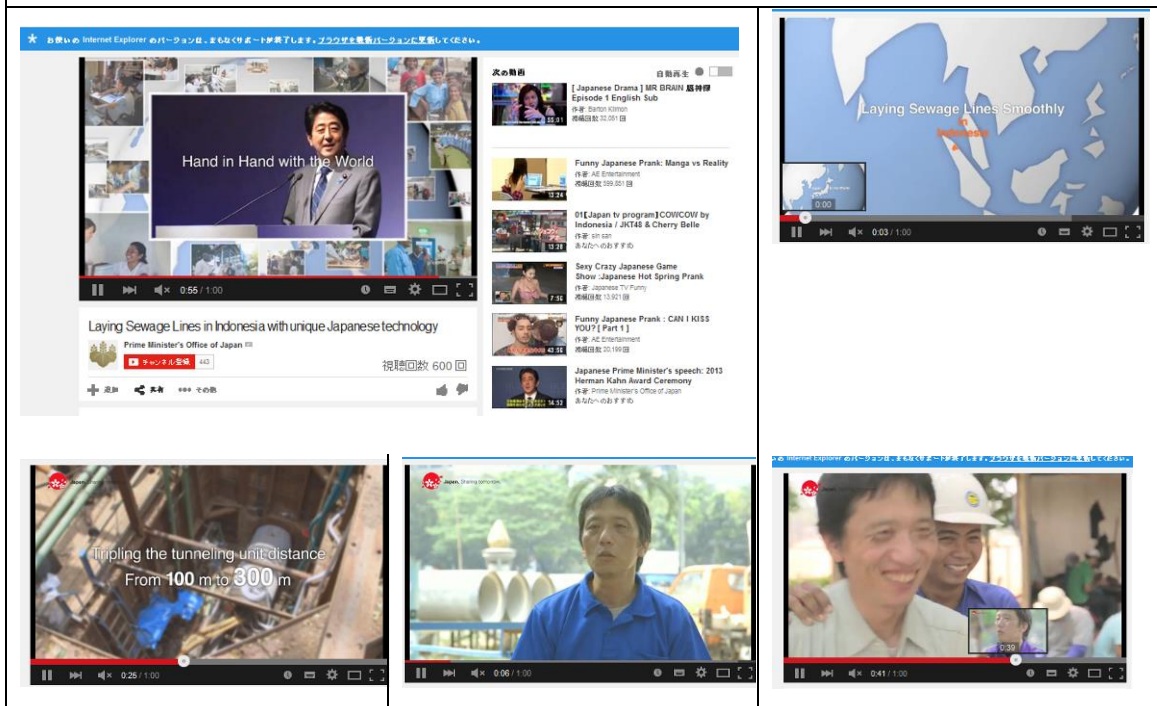
Prime Minister's Office of Japan introduced this pilot project in the website of "You Tube". The technology of Iseki was explained as Japanese unique technology to prevent the negative impact to the traffic during the construction.

Laying Sewage Lines in Indonesia with unique Japanese technology



Prime Minister's Office of Japan

In Indonesia, a Japanese company is working with local people to lay sewage lines smoothly. Mr. Sasaki, a technical adviser from Iseki Poly-Tech Inc. has brought unique Japanese technology for laying sewage lines under roads without stopping traffic.



Source: <https://www.youtube.com/watch?v=aj7xzpPoFGQ&feature=youtu.be>

Figure 3.7 Introduction of the Iseki's Micro tunneling Technology by Prime Minister's Office of Japan

(3) Investigation for the Business Expansion

1) Business Model

Indonesian business market of micro tunneling works has huge potential. Iseki's business in Indonesia will be concentrated to the long-distance and curved micro tunneling method which is the advantageous to the Japanese contractor and supplier. Provision and maintenance of micro tunneling shield machine, supply of its spare parts, and consulting service for the selection of the optimal machine will be the field of the Iseki's main business in Indonesia. With the variety of machines and full support, Iseki will enhance the customer's satisfaction, which is expected to expand their market.

The micro tunneling shield machine will be produced in the factory in Japan and will be imported to Indonesia, which can be compatible with the production of variety of the machines. The Indonesian office will enhance the sales activities to the executing and implementation agencies of water supply, sewerage, drainage, electricity, telecommunication, and information-communication sectors.

2) Business Field and Organization

In addition to the sales of the micro tunneling shield machine, the overall consulting service of micro tunneling technology will be provided by Iseki. The business fields to be considered are listed below.

- Sales of the micro tunneling shield machine
- Proposal of the project to the executing agencies
- Consulting service to select the machine and construction supervision
- Maintenance of micro tunneling shield machine
- Supply of spare parts and consumables of the machine
- Lease of micro tunneling shield machine

3) Business Partner

Iseki will establish the joint enterprise (partnership) with following companies and agencies.

- Target Field: Water Supply, Electricity, Tele-communications, High-ways
- Partners: Ministry of Public Works, Local Governments, PLN, PDAM etc.

(4) Accomplishment in This Pilot Survey

Accomplishments in this pilot survey are summarized as follows.

- a) The understanding of Japanese micro tunneling technology was enhanced through this pilot project and seminar, which will lead to the expansion of our business opportunity in Indonesia

Furthermore, the advantageous effect of Japanese long-distance and curved micro tunneling technology will be acknowledged by the coming construction work.
- b) The partnership with Indonesian supplier and contractor was established through the training program in Japan and OJT in the pilot project.

Further capacity development will be accomplished through the construction work in coming sewerage development project under Japanese ODA loan.
- c) To formulate new micro tunneling projects, the consulting services to the executing agencies and the continuous partnership with Indonesian companies will be essential.

4. FUTURE PROSPECTS

(1) Impact and Effect on the Concerned Development Issues

Through Business Development of the Product/ Technology in the Surveyed Country

In the pilot project, there are several unexpected issues occurred such as the collapse of the drive shaft, the unexpected obstacles of electricity culverts and neglected construction waste. However, Iseki could overcome them with its high technology and careful construction. In addition, following

were found or accomplished through the pilot survey.

- The construction schedule is easily extended in Indonesia due to low labor cost and high imported material cost, which is completely different from Japan.
- The supply chain of constructing machines and materials such as steel is already established in Indonesia.
- The orientation to establish the partnership with Indonesian contractor was confirmed in the project. The technical cooperation will be established in a first stage and the joint venture in future.

Thus, through this project, Iseki could enhance the understanding of Japanese micro tunneling technologies to Indonesian agencies and companies and had the precious experience of microtunneling works in Indonesia which is highly effective to understand the situation and issues of Indonesian market which is completely different from Japan.

As a conclusion, this pilot study is contributed for not only Iseki but also the Japanese companies related to the micro tunneling works to expand their business chance in Indonesia.

(2) Lessons Learned and Recommendation through the Survey

1) Lessons and Learns

In the pilot project, soon after starting the jacking, PLN instructed us to stop the construction work due to the possibility of the interference by the existing electric culvert. From this experience, we found that the information of underground facilities might be different from the actual situation. In addition, it is unclear who will be responsible for unexpected obstacles.

The other thing we have learned from the project is inevitable disruptions of construction for obtaining permission occur due to little adjustment among project related authorities. From local contractor's point of view, these kinds of impediments would induce their cost overrun and unable to control that.

2) Recommendation

We would like to propose the following recommendations.

a) Improvement of the Contract Condition in Design Build Contract

In design-build contract, the contractor has the discretion to decide the construction method of temporal work. However, once unexpected underground facilities (obstacles) were found, the contractor have to owe the additional expenses by themselves to remove them. Furthermore, the extension of construction period will be needed, which requires further expenses for the contractor.

In order to reduce this risk of the contractors, the design criteria which contains the requirements of preliminary survey will be needed to carry out the appropriate survey in the design stage. Also, pre-meeting among related authorities will be effective countermeasure as well.

In addition, the condition of construction, indicated in the design drawings and the contract

documents, shall be defined as the given contract condition. In this context, if unexpected appurtenant works are required in the construction stage, the contract amount shall be amended according to the additional appurtenant works carried out by the contractor.

According to this improvement, it is expected to have the merit for both the contractors and the executing agencies. The contractor can propose the appropriate price in the bidding procedure without considering aforementioned risks and the executing agency can reduce the uncompleted works by the contract-out.

b) The Necessity of Package Type Assistance

For the further dissemination of Japanese technology in Indonesia, the improvement of unfair custom in the contract is essential by the capacity development activity for the staff of executing agency and by the provision of project implementation manual. Especially, as a capacity development activities, the continuous package type assistance consisting of the training course, workshop, the provision of related manuals are desirable by Japanese governmental organization. The central government and large cities in Japan have experienced various construction supervision works and their contract amendments, therefore, these experiences and know-how shall be shared by the training course and the seminar.

c) The Revision of Criteria for Output Basis Payment

In this pilot project, we experienced the delay in customs procedure and delays by interruption of construction work due to the collapse of drive shaft and the obstacles, which cannot be expected in the project in Japan. As a result of the considerable delay to install the micro tunneling shield machine by the delays, the output basis payment was delayed about one year.

Considering the SMEs' insufficient financial basis, they cannot continue their project when they have severe cash flow problem. To relieve the financial burden of SMEs due to such unexpected risks, the criteria of output basis payment shall be improved. For example, if the machine cost and installation cost were separately counted, the financial burden could be relieved in the pilot project.