"Feasibility Survey and Pilot Project for Disseminating SME's Technologies to Developing Countries" under the Governmental Commission on the Projects for ODA Overseas Economic Cooperation in FY2012

Summary Report

Indonesia

Feasibility Survey for Introduction and Localization of Pipe Jacking Technologies for Sewage Works in Indonesia

March, 2013

Yasuda Engineering Co. Ltd. Iseki Poly-Tec Inc.
Kidoh Construction Co. Ltd. NIPPON KOEI Co. Ltd.

This report is a summary of a feasibility survey and pilot project disseminating SME's technologies to developing countries conducted by the contractor, under the Governmental Commission on the Project for ODA Overseas Economic Cooperation, commissioned by the Ministry of Foreign Affairs of Japan in Fiscal Year 2012. It does not necessarily represent the official views of the Ministry of Foreign Affairs of Japan.

Location Map of the Study Area

Summary

1. Present Condition and Issues on Infrastructure Development in Jakarta

Jakarta Metropolitan Region is the second largest metropolis where many skyscrapers stand as capital city of Indonesia. MRT (Mass Rapid Transportation) is on-going project in business central district, and urban development projects are implemented along with MRT station.

Traffic is habitually congested due to rely on insufficient transportation system of private car& motor bike and Trans Jakarta which runs exclusive bus lane. Some trains modestly provide public transportation service.

Urban infrastructure development is indispensable in order to sustain economic development. Public sewerage system is a principal infrastructure of water pollution control, and is now been implemented. Provision and management of underground infrastructures are serious issues for sustainability of Jakarta.

Source: JICA PPP Study Team

Fig.S.1 Urban development projects in Central Business Districts

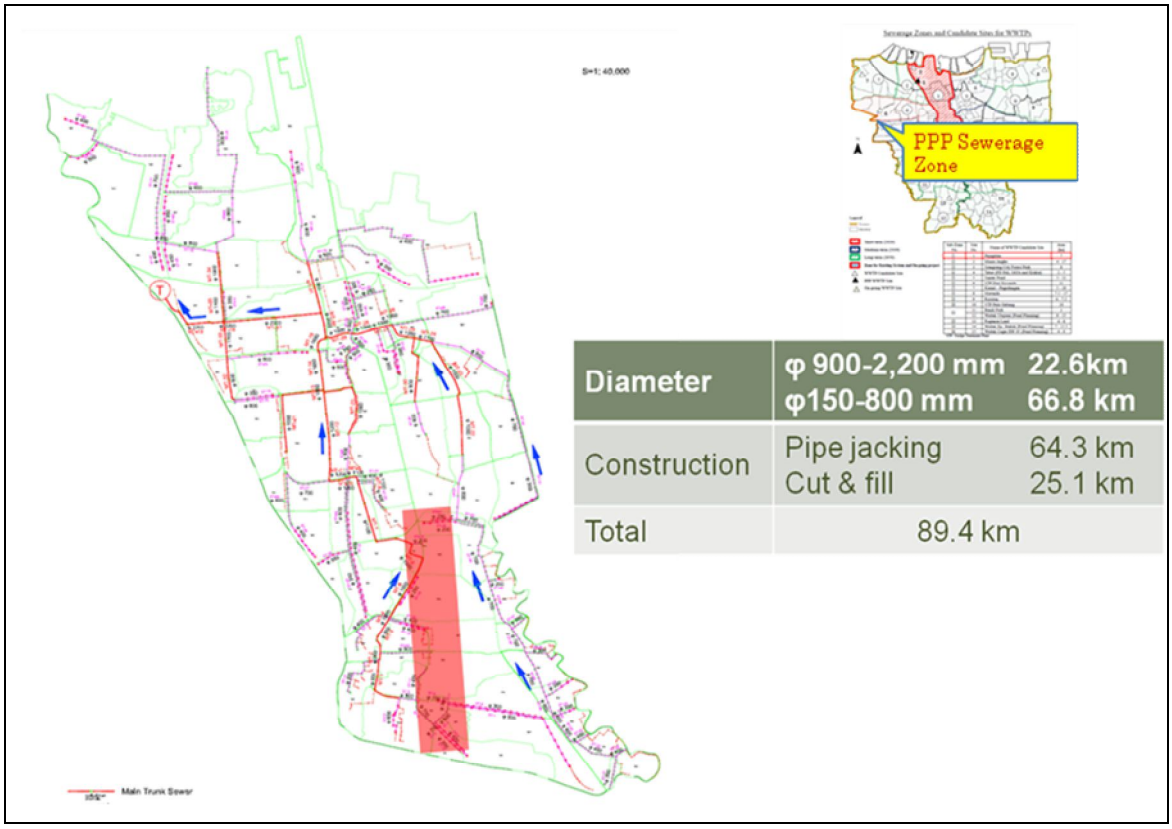
2. Possible Applicability of Pipe Jacking Technology on Sewerage Project

(1) Needs on Pipe Jacking Technology

PPP Infrastructure Project of Sewage Treatment Plant Project in DKI Jakarta proposes to provide sewerage service in whole central sewerage area through construction of sewer main in advance to lateral sewer. This project programming will extract following advantages. Sewer construction shall

not occupy crossing of streets in order to prevent traffic congestion. Accordingly, curve and long distance pipe jacking technology is indispensable for ODA project of sewerage in Jakarta.

- Constructed sewer main contributes to urgent operation of sewerage service.
- Collected wastewater in whole sewerage area restores polluted water environment, accordingly wastewater treatment sustains financial operation.
- Central Business District (CBD), which is the richest and most powerful district, will be served by sewerage. Accordingly commercial buildings in CBD financially subsidy to residents.



Source: JICA PPP Study Team

Fig. S.2 Sewerage Plan of Zone 1 (Central Sewerage Zone)

Sewer main layout plan

Traffic congestion

Source: JICA Pipe Jacking Study Team

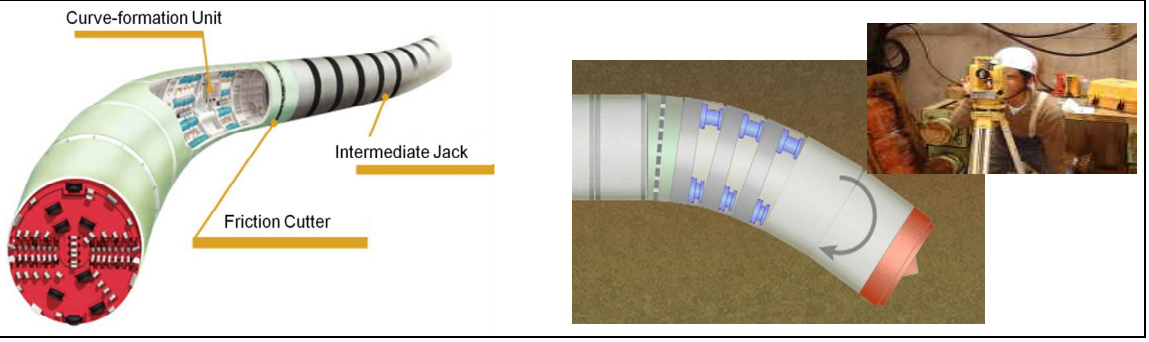
Fig. S.3 Sewer layout plan in congested road

(2) Curve and Long Distance Pipe Jacking Technology

Curve and long distance pipe jacking technology steers and drives shield machine through controlling jacks mounted in shield machine. This technology also constitutes of intermediate jacking system, lubricant to reduce friction of pipe surface and jacking force transformer.

- Jacking system facilitated intermediately in pipe line and drive shaft works at two-step thrust, accordingly jacking force is reduced.
- Lubricant dosing system spreads lubricants uniformly on pipe surface.
- Jacking force transformer made of elastic-plastic resin transfers jacking force uniformly when clearance of pipe connection fluctuates.

Direction of shield machine is controlled through detecting location, gradient and direction obtained by gyro compass. Shield machine is also controlled through detecting location, direction and jacking force (friction) simultaneously.



Source: JICA Pipe Jacking Study Team

Fig S.4 Curve and long distance pipe jacking

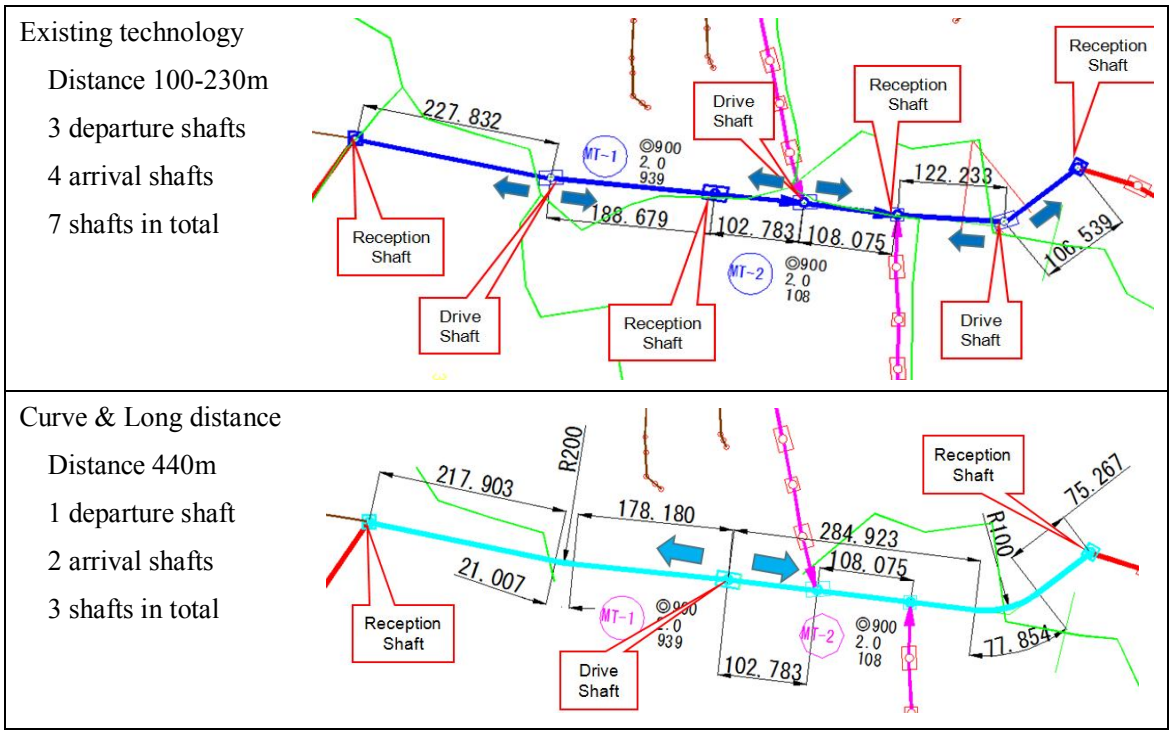
3. Verification of Adaptability to Pipe Jacking Technology

The study team surveyed alternatives of existing technology and curve & long distance pipe jacking on jacking distance, number of shafts and work schedule.

Number of shafts can be reduced to three from seven. Arrival shaft is covered after constructed and traffic opens. Driving shafts, which sustains traffic, is reduced to one from three. Occupation of construction site is reduced and working schedule is also shortened to nine months form fifteen months, equivalent to 160 days reduction. Curve and long distance pipe jacking is also costly competitive with existing technology.

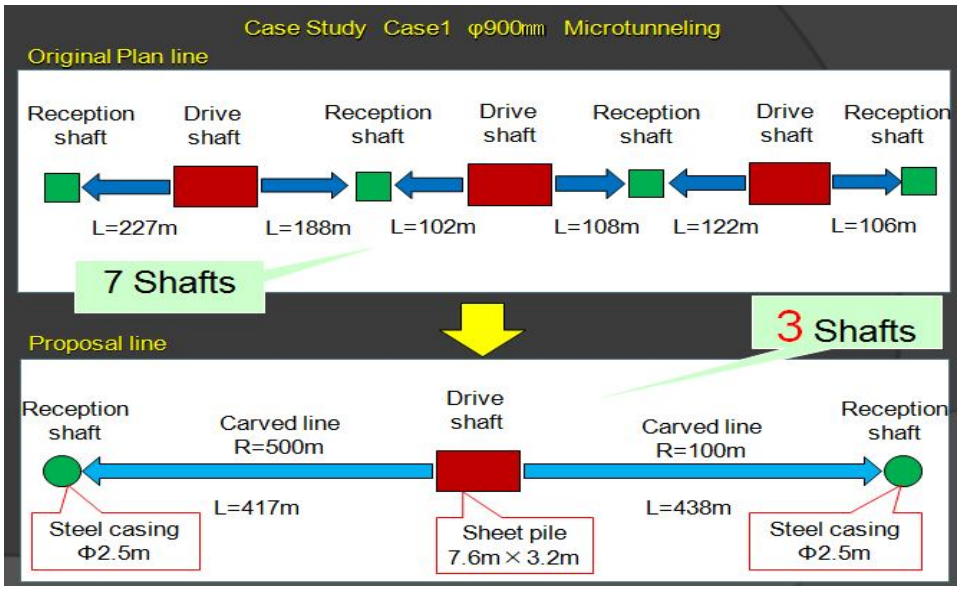
Curve and long distance pipe jacking contributes followings;

- Speed up of sewer construction due to reduction of shafts
- Mitigation of economic loss and traffic congestion due to less occupation of construction site.
- Clean construction due to less construction waste



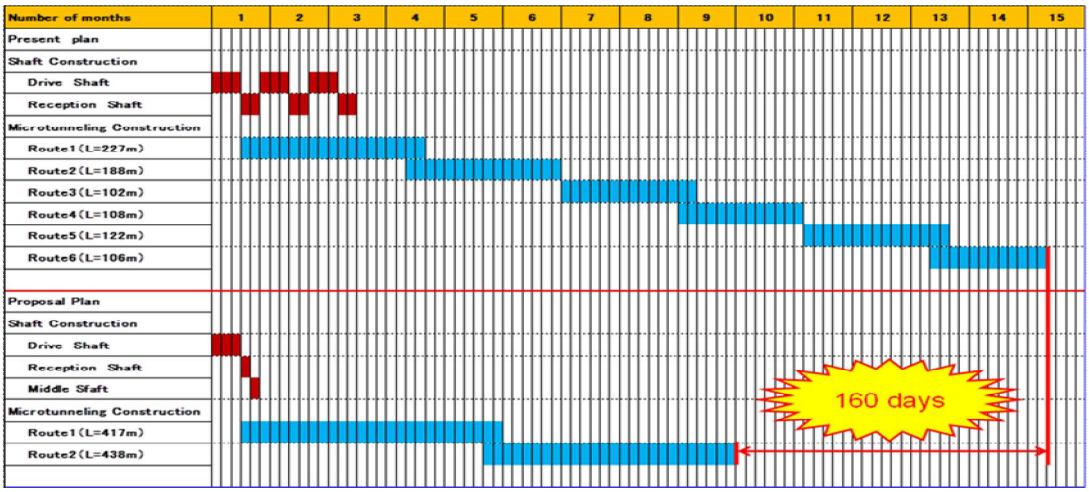
Source: JICA Pipe Jacking Study Team

Fig. S.5 Comparison of Traditional vs. Curve & long distance pipe jacking



Source: JICA Pipe Jacking Study Team

Fig. S.6 Layout plan of shafts



Source: JICA Pipe Jacking Study Team

Fig. S.7 Construction time table

4. Design and Construction Supervision Manual of Pipe Jacking

Design and construction supervision manual aims to retain construction quality and to popularize pipe jacking technology in Indonesia. Design Guideline of Sewerage Pipe Jacking of Japan Sewage Works Association (JSWA) is briefly edited into this manual in English.

JSWA manual defines detailed line-up of pipe diameter same as cut & fill construction. Simplified line-up of pipe diameter in this manual contributes to cost reduction. Meter-sized pipe length also

contributes to convenience.

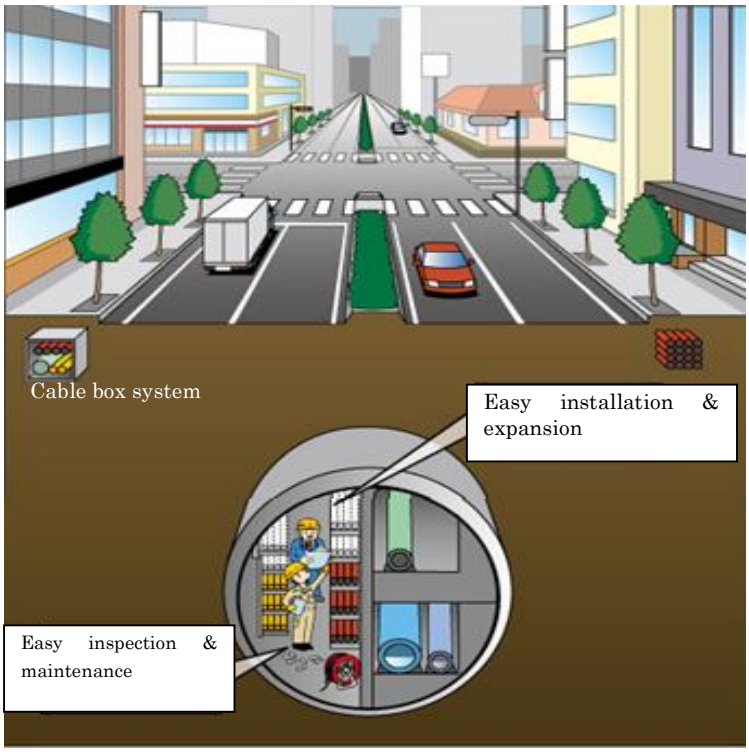
The design and construction manual describes overall pipe jacking technology and defines some design and construction criteria, Accordingly it will be useful for quality management and text book.

5. Proposals for Project Formulation

Underground utilities as electricity, telecommunication and water supply complicatedly occupy main road in Jakarta. Expansion and new installation of utility require careful excavation through such as manual excavation. Existing utilities also requires periodical maintenance since heavy traffic and construction works bring serious damages on underground structure. Failure of infrastructure affects economic and social activities seriously.

Large cities generally facilitate common conduit and cable box system due to easy maintenance and expansion for future demand.

Pipe jacking technology can be applied not only public works of sewerage and storm water drainage but private project of electricity, telecommunication, etc..



Source: Ministry of Land, Infrastructure, Transportation and Tourism

Fig. S.8 Common conduit of utilities

Type (Feasibility Survey and Pilot Project)
Indonesia, Introduction & Localization of Pipe Jacking Technologies for Sewage Works

SMEs and Counterpart Organization

- Name of SME : Yasuda Engineering Co. Ltd./Iseki Poly-Teck Inc./Kidoh Construction Co. Ltd./NIPPON KOEI Co. Ltd.
- Location of SME : Osaka Japan
- Survey Site・Counterpart Organization : DKI Jakarta・Ministry of Public Works and Jakarta Provincial Government

Concerned Development Issues

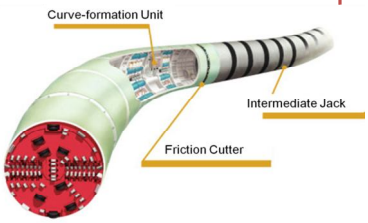
- Underground Infrastructure of Sewerage (Wastewater & Storm water), Electricity & Tele communication and Water Supply
- Mitigation on Social & Economic Loss due to Traffic Congestion
- Clean Construction of Less Construction Disaster & Little Construction Waste

Products and Technologies of SMEs

- Trenchless Technology of Curve & Long Distance Pipe Jacking more than 1km
- State-art Technology of Design & Construction
- Line-up from Small Diameter (100mm) through Large Diameter (5m) applied for Various Needs

Proposed ODA Projects and Expected Impact

- Water Environment Restoration & Sustainable Financial Operation of Sewerage in Jakarta
- Urban Underground Infrastructure & Counter Measure for Flooding
- Clean Construction & Excellent Construction Engineer



Future Business Development of SMEs

- Partner-ship with Indonesian Contractor & Concrete Manufacture