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REACHING THE UNREACHED: CHALLENGES FOR THE 21ST CENTURY

Trenchless technology in India (no-dig method)

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SINCE THE BEGINNING of human civilization as seen in Mohenjodaro and Harappa and elsewhere in the world, digging of open trenches as drains for water supply, sanitation, channels for irrigation etc. was a common practice which is continued even today for laying of almost all underground utility services like water supply, sewerage pipelines, underground power and communication cables, petroleum and gas pipe lines etc. Cutting of highways and busy roads in the cities is a common occurrence in India almost every day which a commuter is made to suffer in silence.

Digging open trenches is a simple, labour-intensive method which did not pose any problem until recently. Cities with growing population have road congestion, vehicular traffic jams, increasing emission and pollution problems, accidents etc. Adding to these if streets are dug for laying pipes and cables either new or part of renewals / repairs, it will aggravate the situation further. If it happens to be a rainy season or involves dewatering, we will have the poor commuters suffer for many days till the work is completed. In India, we still do not value much for the 'social costs' involved in such delays.

Need for adoption of trenchless technology in India

In many of the developed countries like Japan, Germany, USA, Holland, UK and many European countries, even in Singapore and Australia, trenchless technology ("no-dig" or "minimum digging") method has been widely used for the last two or three decades. It has to make its application in populous countries like India and China. Although no comprehensive code of practice on trenchless technology has been published in any of these countries so far, the method is very well perfected. Equipment is manufactured and widely used. Special materials like jacking pipelines are manufactured to codes of practice. Even proper geotechnical investigations and detection equipment are readily available. The cost of doing the job by trenchless technology is more than for the conventional open trench digging method in India, where labour is cheaper and readily available. If the 'social coat' is worked out realistically and added to this cost, then we will find that the cost of doing the job by trenchless technology would be much less or comparable. Singapore experience shows that over the years of practice and adoption, trenchless technology is cheaper if not comparable to open cut method.

Environmental pollution control has assumed greater importance universally by all mankind beyond the narrow political boundaries and this is one of the foremost challenges for the 21st Century for the very survival of human, animal and all plant life on the globe. Compared to traditional open cut method widely used in India and in underdeveloped countries, trenchless technology accrues numerous economical, ecological and environmental benefits to the society which needs to be appreciated. The following are the inherent disadvantages of the open cut method, which are eliminated by adopting trenchless technology:

- Traffic hindrance, traffic obstruction, accidents, providing diversions and their maintenance.
- Environmental pollution, dust and air pollution by vehicles and machines, noise pollution, ground and surface water pollution, etc.
- Loss to commerce and industry due to reduced sales, low productivity, increased consumption of petrol, oil and lubricants.
- Citizens and society have to bear more burden by way of increased avoidable cost in repair and rehabilitation roads, compensation for damage, disadvantage of early availability of utility and public hindrances.
- Hence, there is an immediate need for adoption of trenchless technology in India selectively and later on a large scale and full application as the expertise is built up in the country and the industry gears up to cope with materials and indigenous equipment.

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Many of the delegates to the 22nd WEDC Conference may be conversant with the trenchless technology already adopted in their countries and may like to highlight how the same can be speedily and usefully adopted in India and other developing world in their quest for 'reaching the unreached — challenges for the 21st Century' basically in the field of water supply, sewage treatment, liquid and solid waste disposal and protecting underground and surface water pollution. The Government of India has accorded high priority to infrastructure development and is liberal in welcoming new technology in all fields by joint ventures and participation of multinational companies. India provides a vast market for trenchless technology as part of public health engineering projects to serve the millions wit drinking water and sanitation in both urban and rural areas.

Formation of a technical committee

Government of India, Ministry of Urban Affairs and Employment, has constituted a Technical Committee under the aegis of the National Building Construction Corporation Ltd. to study the various aspects of trenchless technology and recommend for its adoption in India. The Technical Committee has held a series of meetings and is in the process of compiling its report. The following are the four sub-committees:

- geotechnical;
- technology;
- materials
- byelaws and legal.

In addition, NBCC Ltd. has put up some live technology demonstrations in Delhi and Mumbai to project its application to laying of MTNL cables across roads and under busy Western Railway tracks. NBCC was also successful to lay a grid of earthing conductors under live 66/33/11 KVA NDMC sub stations by using impact moling and horizontal directional drilling equipment. NBCC is also encouraging private entrepreneurs and engineers to buy the equipment and enter in this field which has vast potential of work.

Trenchless technology

Definition

Trenchless technology can be defined as an innovative process of installing utilities like sewers, water and gas pipelines, electricity and communication cables and other underground facilities (such as pedestrian subways / underpasses), rehabilitating, amplifying and reconstructing the existing underground utilities without digging the ground above or minimum digging.

It is used almost exclusively for underground utility services of non-man-entry size micro-tunnelling, i.e., size less than 1000mm to 1200mm diameter or rectangular section of 1000 x 600mm.

Trenchless technology systems for underground utility services fall into four broad categories:

- Micro-tunnelling, pipe jacking.
- Installation of utility ducts including service connections.
- On-line replacement of an existing pipeline or duct.
- Renovation of an existing pipeline or duct.

Associated with these systems are a number of essential services required prior to selection of a trenchless system to be adopted, in particular:

- Site investigation to determine soil and ground water condition.
- Inspection to determine the condition of the pipeline;
- Location survey to determine the position of existing pipelines, other services and potential obstacles.
- Other geotechnical investigations to decide on the type of equipment and methodology.

Other trenchless systems for installing utilities:

- impact moling;
- impact ramming or pipe ramming;
- thrust boring;
- horizontal directional drilling (HDD);
- guided boring;
- wash boring, etc.

Potential market

India is the most populous country in the world next only to China. In spite of the planned economic growth, the urban centres / cities have been growing, population continuously migrating from rural areas to urban areas. Delhi, Mumbai, Calcutta, Madras and Bangalore etc. have already reached their limit of congestion, pollution, shortage of water supply, breakdown and blockages in city sewerage systems calling for municipal / public health engineers to undertake immediate measures to provide new or renovate and repair existing utility systems.

Government of India has also laid stress on immediate development of infrastructure. India is poised to offer a huge market for trenchless technology particularly for manufacture of equipment, materials and other geotechnical equipment. It also offers a growing employment opportunity for public health engineers, technicians and semi-skilled workers all over India.

Currently very few engineers are aware of the advantages of trenchless technology in India. As the awareness grows, social costs evaluated the choice will be for trenchless technology from open cut method. Cost of labour is increasing. It is bound to be exorbitant soon. Decisions will be based on speed, avoidance of hindrances, pollution problems, productivity and not mainly on labour and labour cost. In such a case, trenchless technology will be the right choice.

Trenchless technology projects in India

Gas Authority of India Ltd has extensively used this system in laying the gas pipe lines from Gujarat gas fields to Northern India selectively for crossing roads and railway lines. In the past water supply and sewerage schemes were planned in Madras and Srinagar. But the projects did not start due to political and economic considerations. Currently, in Mumbai a sewerage project is under consideration using the micro-tunnelling method. It is hoped that the Mumbai Municipal Corporation will go ahead with the scheme soon. NBCC Ltd and its associate firms are trying to popularise trenchless technology by laying the MTNL fibre optic cables across roads and railway lines by using trenchless technology equipment. A technical committee under the aegis of NBCC Ltd will soon bring out a 'National Guidelines for adopting trenchless technology in India' similar to the 'Yorkshire Code of Practice for Microtunnelling' and the 'Guidelines compiled by Louisiana Technical University, USA'.

Role of government in India

Nowhere in the world where trenchless technology is adopted, governments have issued any legislation. Based on the inherent advantages, governments have only facilitated and encouraged the industry to adopt the technology in their countries. The success story from Singapore shows how they introduced the technology just by banning digging of open trenches across the roads. In some cities the methodology is inevitable. For crossing of railway tracks, canals and even river beds etc. trenchless technology is the right answer.

Government of India should also follow similar role as facilitator by encouraging the use of trenchless technology, at least selectively in metropolitan cities, across the busy roads and highways, railways etc. Immediately put a ban on cutting of roads by recommending use of trenchless technology methods to lay the utilities. Industry and engineers / contracting firms will adopt new technology automatically. Doors are wide open inviting foreign companies to join with Indian firms in technology tie-ups. There will be automatic boost in manufacturing industry to manufacture materials and equipment specially required. With the huge manpower, India can even venture to go abroad in underdeveloped countries to propagate the technology and expand its business.

Conclusion

The time will soon come when the conventional method of open trench digging will be selectively banned in India. To begin with, work should be undertaken for crossings under roads, national highways, railways, canals etc. and all renovation of sewerage systems in metropolitan cities. In our march to the 21st Century civil, mechanical and public health engineers have greater roles to play. They are competent to introduce the technology without waiting for the formal orders or government intervention. Municipal authorities all over India can lay guide lines to adopt the technology. National highway authority, Ministry of Surface Transport, Ministry of Environment, communications, water resources, petroleum etc. can issue just departmental letters to their engineers to adopt this technology selectively to start with and by the year 2001 AD we hope to see India on the map of trenchless technology in the world. Enough know-how and technology is available to make a beginning in the field.